VOL. XXII, No. 3 MARCH, 1949

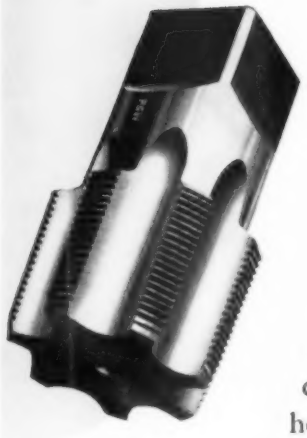
THE TOOL ENGINEER

OFFICIAL PUBLICATION: AMERICAN SOCIETY OF TOOL ENGINEERS

Departments

Behind every manufactured product is the tool engineer

What does it stand for ON A TAP?



P&W - PRATT & WHITNEY,

of course — a name that every worker in metal associates with precision production.

Think what it means on small but critically important precision tools like taps:

- tap steel made to exacting P&W specifications and subject to rigid inspection in our large and completely equipped metallurgical laboratories.
- tap design, heat-treatment, finish, inspection that assures the very finest quality and dependability of performance.
- *tap engineering* service that goes all the way through to assure the right tap and tapping procedure for the job, the lowest cost per tapped hole, whether the tap is standard or special. P&W Taps cover all types and sizes.

Wouldn't it be a shrewd move on your part to standardize on P&W Taps? Try a few and see. Our 444-page Small Tool Catalog contains complete listings.

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Division Niles-Bement-Pond Company
WEST HARTFORD 1, CONNECTICUT

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The Tool Engineer

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March, 1949

Vol. XXII, No. 3

Editorial

The Goose That Lays the Golden Egg

AS TOOL ENGINEERS, we know very well what a tool is. We recognize it as a very useful implement which saves labor, time and money, as an essential to efficient production on any scale, be it large or small. We are, however, accustomed to thinking of a tool as a very tangible item, fashioned from wood or metal or some similar material.

But there are tools of production that are not made of steel. Many of these are not generally recognized because they don't fit into the standard pattern of thinking in regard to production. One of these is profits derived from industry. The people who continually snipe at the profits of manufacturers do not realize what they are shooting at or how dire the consequences would be if they were successful.

Profits are one of the most vital tools with which we work under the American system of highly productive free enterprise.

When people try to destroy the profits of industry, they are essentially undermining our whole American way of life which demands a high volume of employment, a top pay rate and the best living standards in the history of the world. They are seeking to do away with the things which they actually hold very dear.

Elimination of profits from industrial production would be the best example in history of killing the goose that lays the golden egg.

Every productive facility of any type that has ever been erected, or ever will be, is a direct result of profits earned in some productive enterprise! Every worker in this country owes his job to profits derived from the industrial and business enterprises of the country and that is true of government employees as well as workers in private industry.

One thing that has led to the dangerously too-popular clamor for drastic curtailing of profits is that people aren't yet accustomed to thinking in terms of the low value dollar. The question is whether or not industrial profits are too high when measured in terms of today's dollar. The cost of living has gone up for the corporation as well as the individual. When they shop for raw materials, labor and equipment, they find prices are up, just as does the housewife who visits the meat counter in her neighborhood grocery.

Another point often overlooked is the use to which profits are put. Many assume they are all paid out in dividends. This decidedly is not true. The current trend is toward a steadily decreasing distribution to stockholders, and that, naturally, makes it more difficult for industry to attract new capital. And so it becomes necessary for industry to hold back an increasingly large amount to finance expansion of facilities and the replacement of outmoded or worn out equipment.

Funds for expansion and modernization are of vital importance today. We are faced with an increasing population, requiring a proportional gain in employment. To obtain this, industry must utilize the tool of profits to the fullest extent and efficiency.

This is a tool whose importance we cannot afford to under-estimate. Any serious interference with profits would indeed be cutting off the fountainhead of our economic well-being. Prevention of this is vital to all of us, as tool engineers and as individuals. Let us protect the goose that lays our golden egg.

I. F. Holland

President 1948-49

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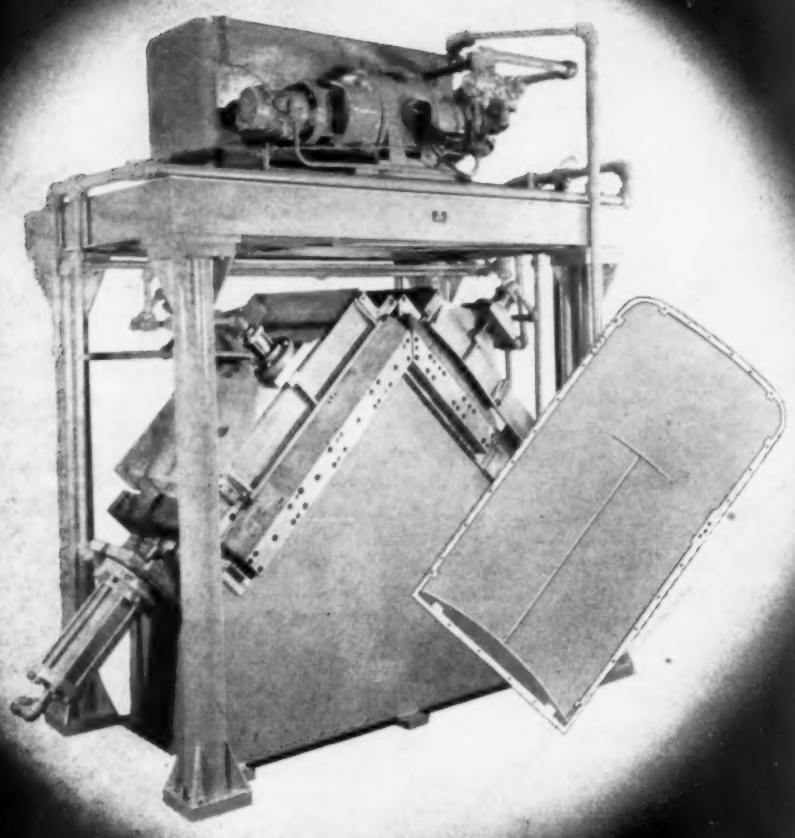
IMAGINE!
1 PANEL—
7 SECONDS



HYDRAULIC FLANGE AND PIERCING MACHINE

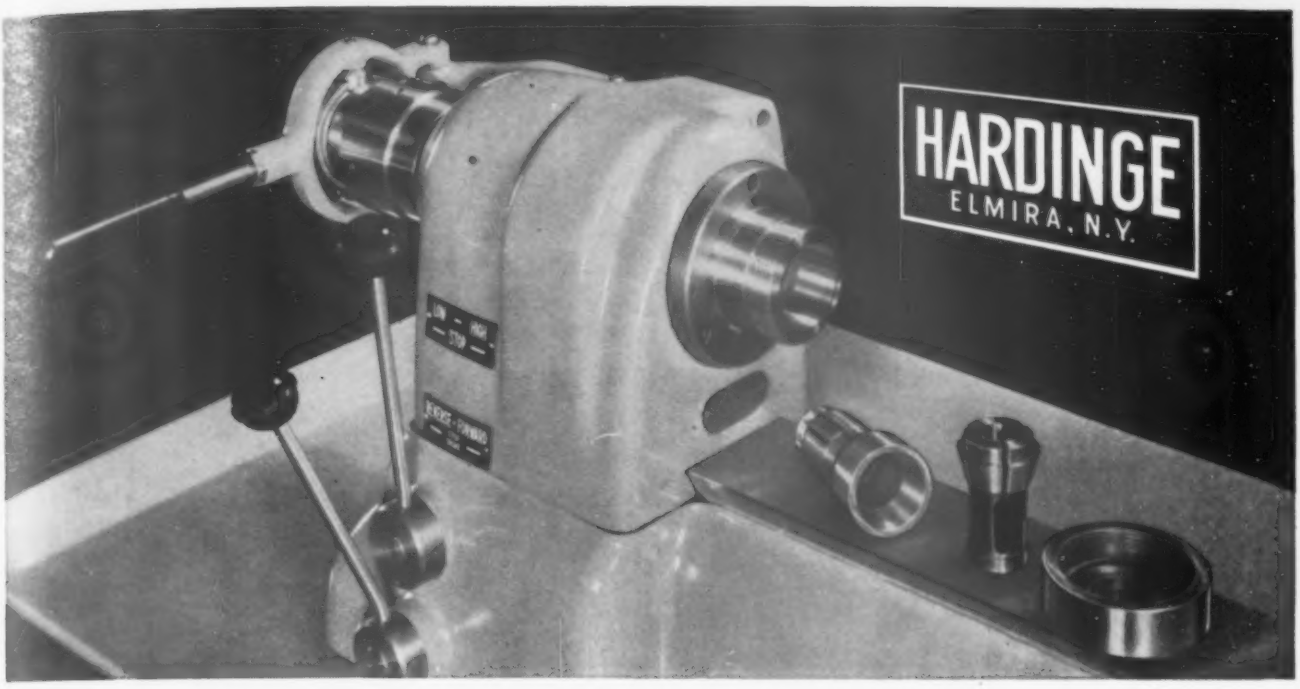
speeds intricate panel fabrication for many end products

Vulcan's automatic flange and piercing machines are rapidly replacing older methods which use conventional punch press set-ups, multiple dies involving maintenance, and manpower. By applying the Vulcan Hydraulic Technique, presses are released for other work, labor charges reduced, and production increased amazingly. Considering the above application only . . . material moves to both sides of the machine, permitting bottom and hinge edge form and holes pierced on the one hand — top and handle edge together with holes pierced on the other, resulting in one complete panel each machine cycle, at 7 seconds.

Vulcan Hydraulics
- Form
- Pierce
- Flange
- Assemble

The Hydraulic Machine principle for Die Operations can be utilized in many panel forming and piercing applications. Mail us your product part prints for our advise or quotation. No obligation.

Vulcan Tool Co.
DAYTON 10, OHIO, U. S. A.
COMPLETE TOOLING PROGRAMS

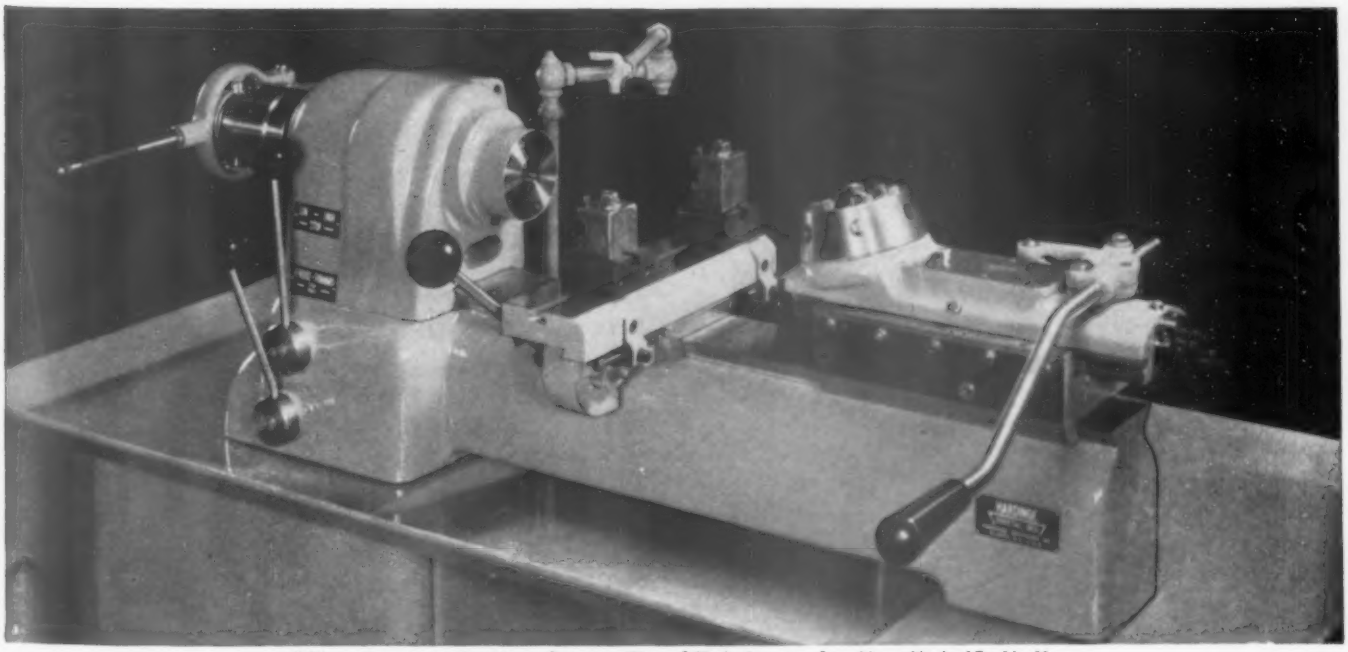


HARDINGE

High Speed Precision Second Operation Machine *with* STATIONARY COLLET

Close observation in Production Departments reveals the need for a specific type of machine for a certain class of work. This is particularly true when close tolerances exist for length or shoulder-specifications. In such instances, push-out or draw-in collets are not as satisfactory as a stationary collet arrangement.

This machine combines all the features of the model DSM59 Hardinge Second Operation Machine with the addition of the stationary collet feature (No. 21 Brown & Sharpe Style Collet) for length holding second operations. Ask for bulletin VBS.



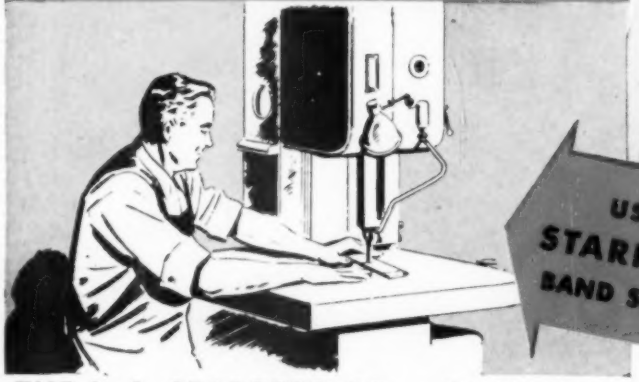
Offices in principal cities. Export office, 269 Lafayette St., New York 12, N. Y.

SAVE 2 OPERATIONS

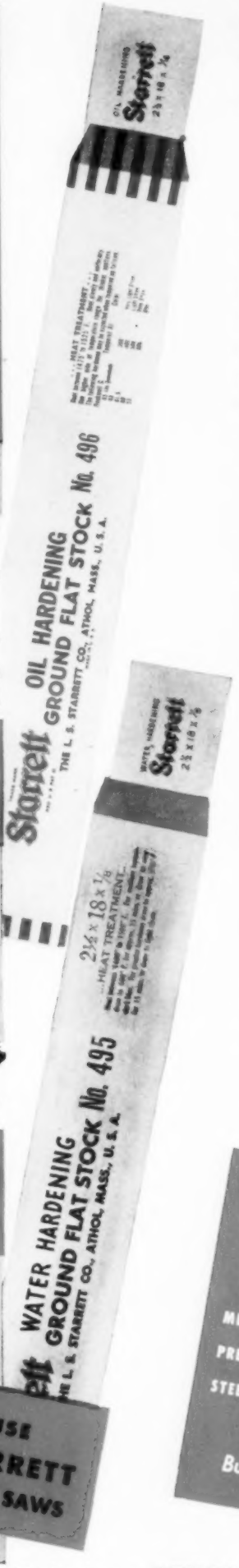
Producing Small Precision Parts

Just LAY IT OUT...

and CUT IT OUT



USE STARRETT BAND SAWS



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Hunting up stock and grinding it to size for parts like special gages; templates; jig, fixture and machine parts; punch dies; etc., ties up men and machines—takes time that can be put to better use today. A supply of STARRETT Precision Ground Flat Stock will stop that waste. Your STARRETT Distributor carries a complete stock. Order a supply today.

STARRETT Precision Ground Flat Stock is high grade annealed tool steel cut lengthwise from the sheet and ground to within .001" in thickness, 18-inch lengths, widths from ½ to 6 inches, thicknesses from 1/64" to 1" and more. Each piece individually wrapped and marked with size, type and heating instructions.

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A non-deforming, electric furnace tool steel, fully spherodized annealed with fine grain structure and deep hardening characteristics. Ideal for precision parts which require accuracy of size after hardening.

No. 495 WATER HARDENING

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Starrett

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Another BIG STRIDE in *Extra* SERVICE

Chromium Plated

STANDARD **DuBo*** **PLUG GAGES**

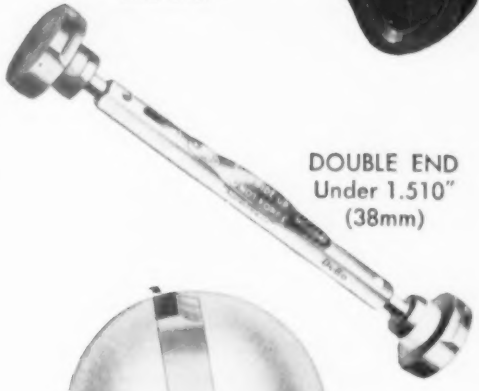
DuBo Plug Gages have already won an excellent reputation for long-enduring service. Exceptionally long wearability is inherent in their basic design. *Now chromium plated gaging surfaces, available at very little extra cost, add a tremendous plus to their service life.*

For long runs and the more abrasive materials specify *Chromium Plated* DuBo Gages.

Be Sure To Write For DuBo Bulletin

*Patents Pending

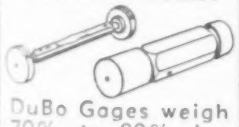
SINGLE END
Size 1.510" (38mm) and over



DOUBLE END
Under 1.510" (38mm)

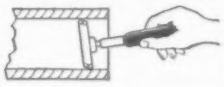
GAGING SURFACES are portions of a sphere

LIGHT IN WEIGHT



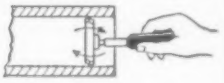
DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size.

EASY TO ENTER



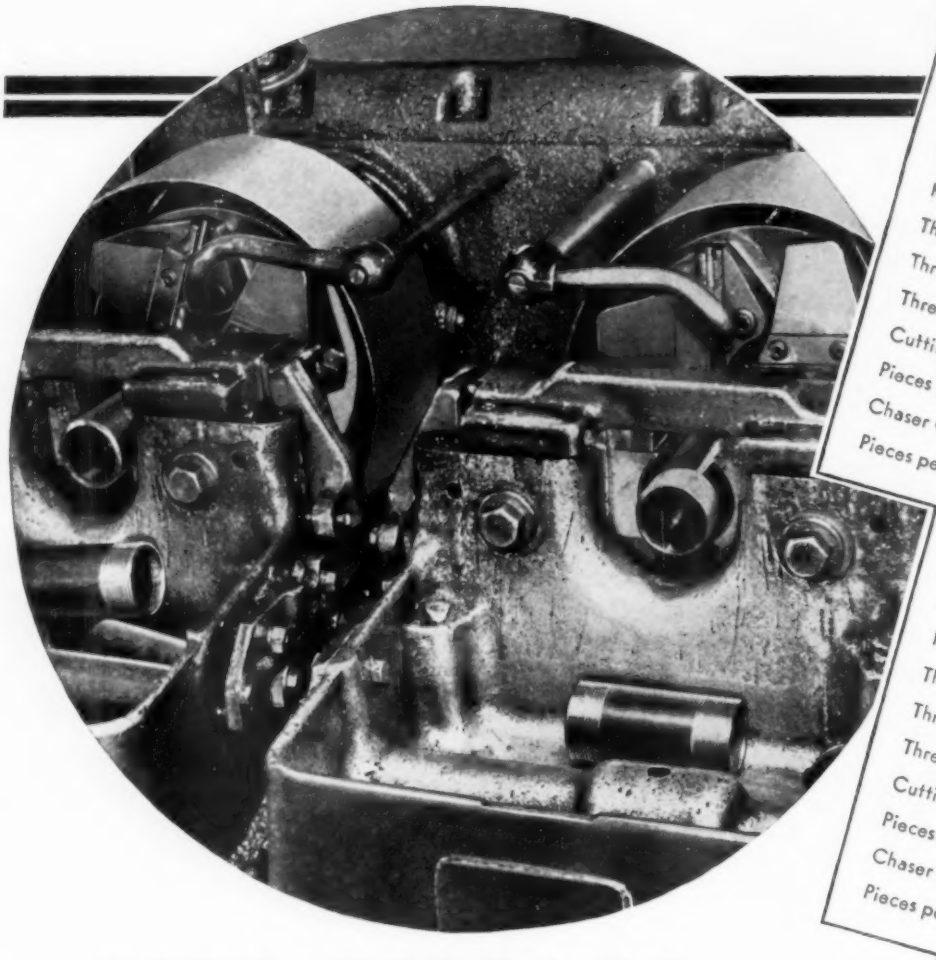
Simply tip handle slightly above bore axis. Enters even undersized bores easily.

DEFINITE CHECK



Whether or not handle drops freely below center is definite yes-or-no answer.

STANDARD GAGE CO., INC.
Poughkeepsie, N.Y.



LANDIS MACHINE COMPANY
ENGINEERING DATA
Name of Part 3/4" x 2 1/2" Pipe Nipple
Material Galv Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 33 Ft. P.M.
Pieces per Hour 450
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3600

ENGINEERING DATA
Name of Part 3/4" x 10" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 14
Thread Limits ± 1 1/2 Turns
Thread Length 13/16"
Cutting Speed 38.3 Ft. P.M.
Pieces per Hour 400
Chaser Grind 22° and 88°
Pieces per Chaser Grind 3400

ENGINEERING DATA
Name of Part 2" x 6" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1"
Cutting Speed 42.8 Ft. P.M.
Pieces per Hour 200
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 1800

ENGINEERING DATA
Name of Part 1 1/2" x 5" Pipe Nipple
Material Butt Weld Pipe
Thread Pitch 11 1/2
Thread Limits ± 1 1/2 Turns
Thread Length 1"
Cutting Speed 35.8 Ft. P.M.
Pieces per Hour 232
Chaser Grind 22° and 89 3/4°
Pieces per Chaser Grind 2000

PIPE NIPPLES...

450 pieces per hour
3600 pieces per chaser grind

Such production is proof of "high production and low cost"—yet thread tolerances are held to specifications. These figures are production results of a manufacturer producing steel pipe nipples, using LANDMACO machines equipped with air-operated carriage fronts. Different conditions might make an even higher output possible.

LANDMACO Pipe and Nipple Threading Machines thread, ream, and chamfer in one operation. Built in 1¼" and 2" single- and double-head models, these machines are equipped with either internal or external trip heads.

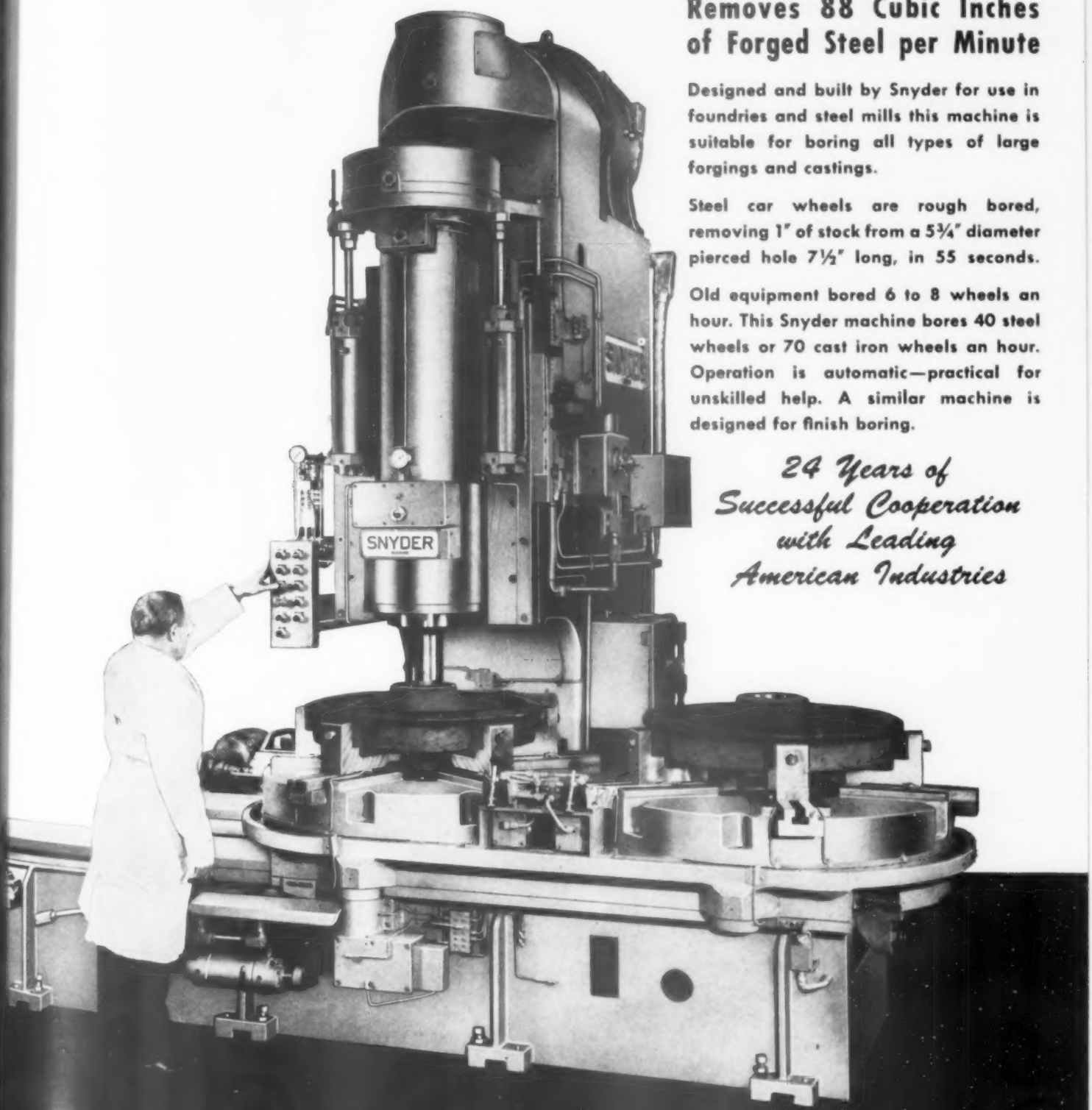
WRITE FOR BULLETIN D-84

LANDIS Machine COMPANY
WAYNESBORO PA., U.S.A.

WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

SNYDER

MACHINE FOR BORING BIG FORGINGS



Removes 88 Cubic Inches of Forged Steel per Minute

Designed and built by Snyder for use in foundries and steel mills this machine is suitable for boring all types of large forgings and castings.

Steel car wheels are rough bored, removing 1" of stock from a 5¾" diameter pierced hole 7½" long, in 55 seconds.

Old equipment bored 6 to 8 wheels an hour. This Snyder machine bores 40 steel wheels or 70 cast iron wheels an hour. Operation is automatic—practical for unskilled help. A similar machine is designed for finish boring.

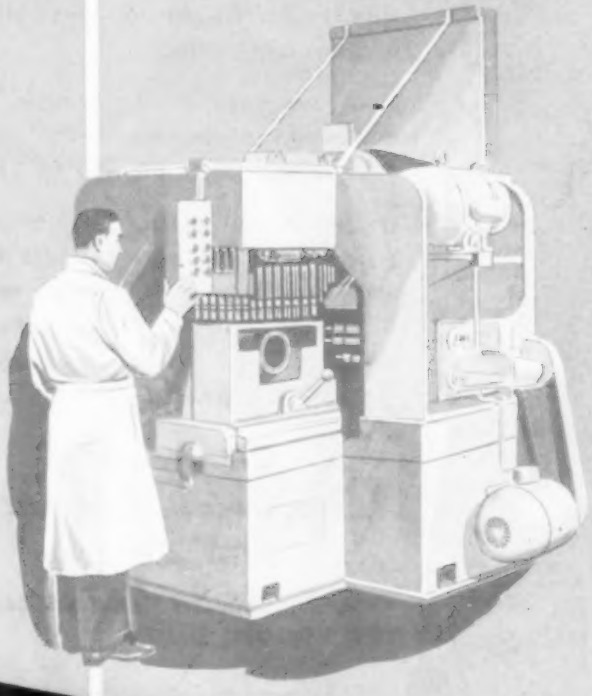
24 Years of Successful Cooperation with Leading American Industries

SNYDER TOOL & ENGINEERING CO.

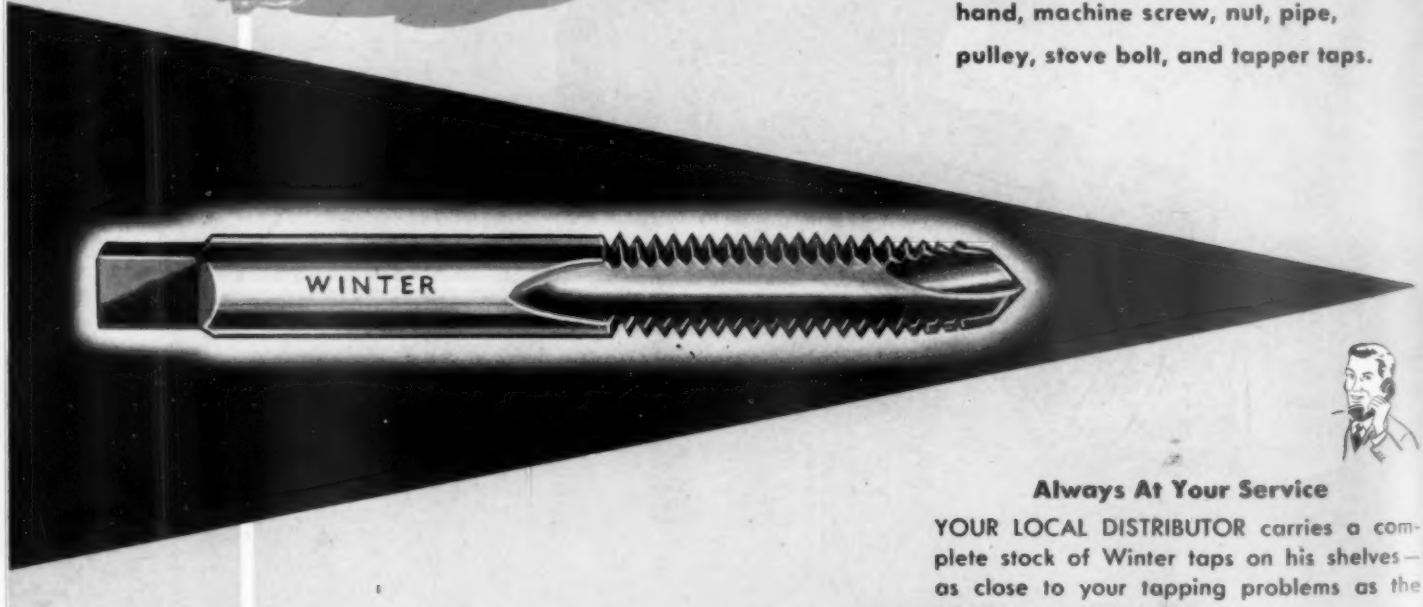
3400 E. LAFAYETTE, DETROIT 7, MICHIGAN

WINTER

TAPS IN ACTION



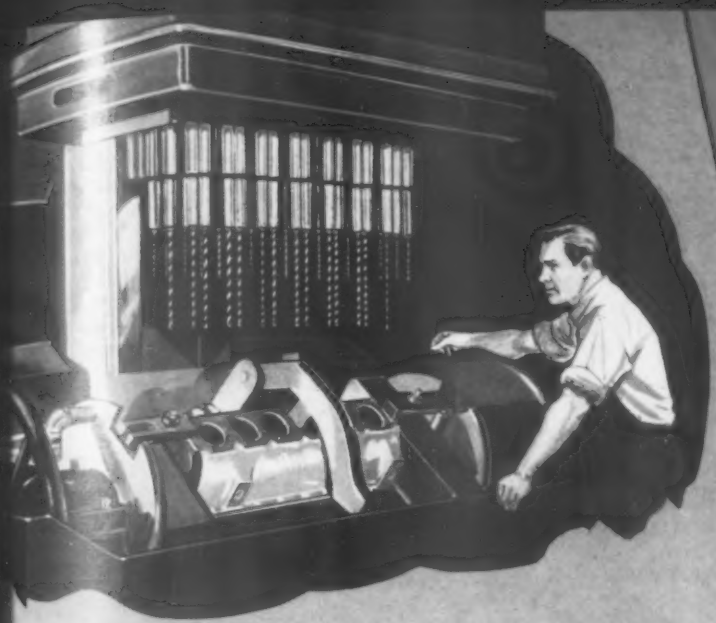
WINTER CHIP DRIVER TAPS are among the strongest taps made, and are well-suited for all classes of work except blind holes. They make a shearing cut that turns the chips ahead of the tool, permitting better lubrication of the cutting edges. This reduces the danger of clogging and breakage, and makes operation at higher speeds possible. Winter Chip Driver Taps are part of the complete Winter line of taps and dies, which also includes hand, machine screw, nut, pipe, pulley, stove bolt, and tapper taps.



Always At Your Service

YOUR LOCAL DISTRIBUTOR carries a complete stock of Winter taps on his shelves—as close to your tapping problems as the telephone on your desk.

WINTER BROTHERS COMPANY • Division of the National Twist Drill and Tool Company
Rochester, Michigan, U. S. A. Distributors in Principal Cities • Branches in New York, Detroit, Chicago, San Francisco



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NATIONAL TAPER SHANK AND STRAIGHT SHANK TWIST DRILLS are recognized for the ability to maintain high production. This is the result of careful material selection, design based on many years' experience, and skilled manufacture. National's complete line of drills also includes many other types such as three- and four-groove drills, jobber and wire drills, combined drills and countersinks, and special drills. In addition, National makes reamers, milling cutters, counterbores, end mills, hobs, and special tools.

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LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL cutting tools. Call them for cutting tools or any other staple industrial product.

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National

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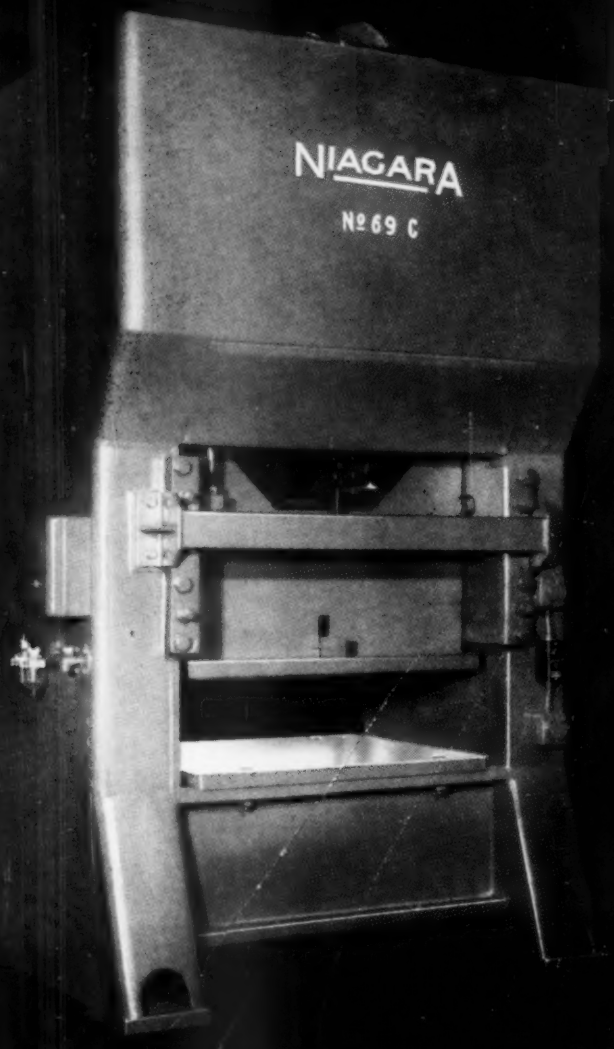
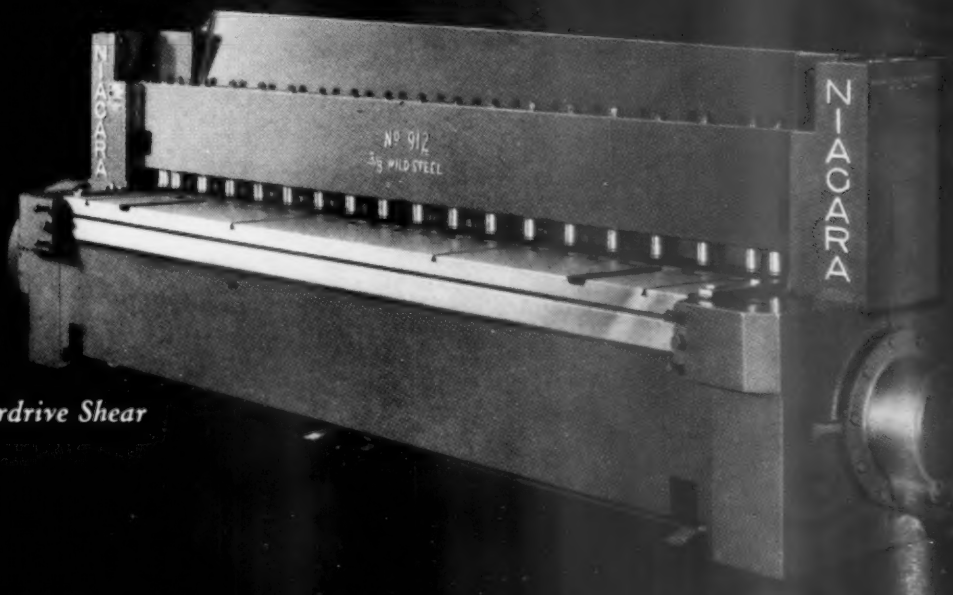
FOR ADVANCED DESIGN *look into....*

NIAG



Niagara Double Crank Press

Niagara Deep Throat Press



Niagara Underdrive Shear

NIAGARA MACHINE AND TOOL WORKS, BUFFALO 11, N. Y.

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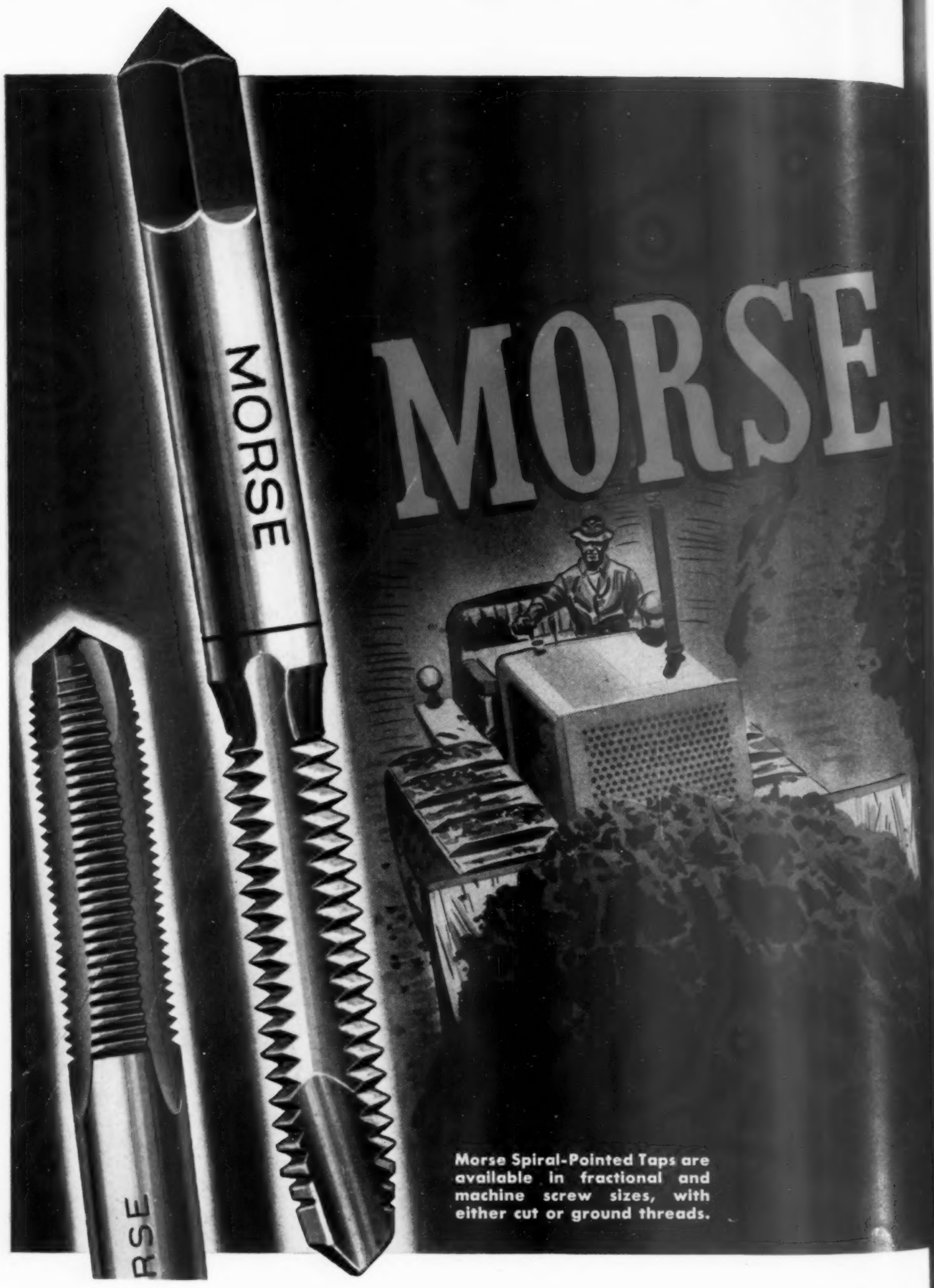
Niagara Double Crank Gap Press

America's most complete line of

PRESSES, SHEARS, TINNERS TOOLS AND MACHINES FOR PLATE AND SHEET METAL WORK

District Offices: Detroit, Cleveland, New York


MORSE
MORSE
RSE
Morse Spiral-Pointed Taps are available in fractional and machine screw sizes, with either cut or ground threads.

Spiral-Pointed TAPS Cut Cleaner Threads Faster

...because they have Extra Strength to "Bulldoze" the Chip Ahead of the Tap

Here's the tap for top performance in tapping through-holes (not blind) in any metal or material. For the Morse Spiral Point keeps chips out of the flutes, forces them *ahead* of the tap, and *out* the bottom of the through-hole. So the tap cuts continuously, without ever backing it up to clear loose chips.

This means faster tapping, cleaner threads, and no damage to any threads that may be already cut in the work.

What's more, tap flutes don't have to be as deep as on regular taps . . . that's why Morse Spiral-Pointed Taps have heavier cross-section, greater strength, *far greater resistance to breakage.* And these chip-free flutes mean freer flow of coolant, right down to the cutting edge.

So for top tapping efficiency and lowest tap costs, ask your Morse-Franchised Distributor, today, to recommend the right Morse Spiral-Pointed Tap for your job.

SOLD EXCLUSIVELY THROUGH MORSE-FRANCHISED DISTRIBUTORS

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MORSE TWIST DRILL & MACHINE COMPANY

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A DIVISION OF VAN NORMAN COMPANY

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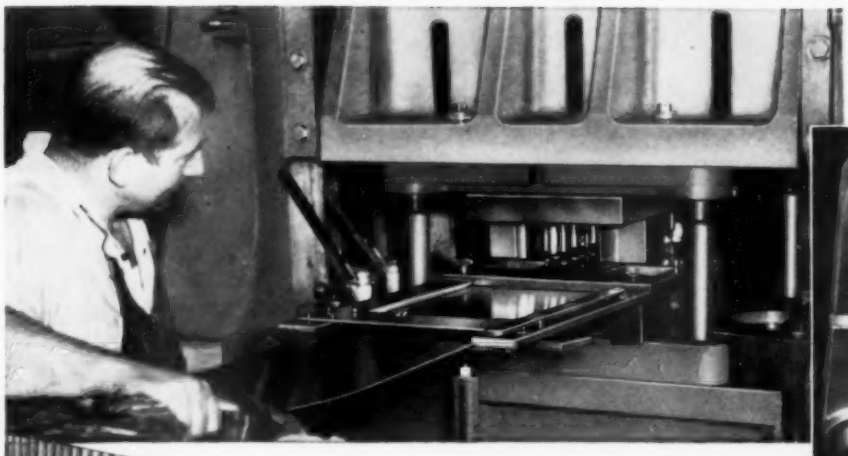

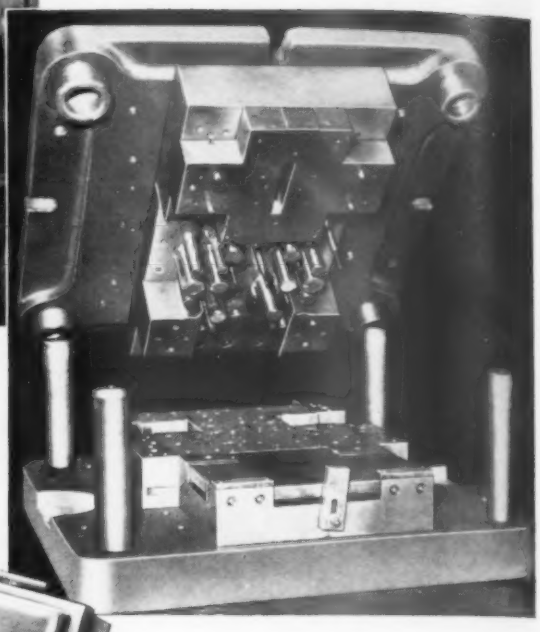

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AND PROGRESSIVE DIE

With the use of a Producto 4 Post Die Set and modern die design, the Trumbull Electric Manufacturing Co. has stepped up production, increased accuracy and cut unit costs. The operations of this particular die include...cut box corners, pierce holes, cut knockouts, bend, form welding projections, set back knockouts, and cut off. (One other operation finishes box forming.)

Material: Coiled 10-9/16 x 16 ga. C.R. steel is hand fed to die from automatic coil cradle. *Tolerances* of ±.005 are held in some cases, and slightly higher on other operations. *Die size:* 23-3/4" x 18". *Press:* 160 ton Bliss.

Through the complete manufacturing cycle Producto Standard and Special Die Sets are held to the strict requirements established for every phase of machining. When your set is ordered from "Near Neighbor Service," there's no lost motion . . . no red tape. Shipment is fast . . . plus values built into your sets assure long, low-cost service life. Specify PRODUCTO.

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CAMDEN, N. J. 4-7765
CHICAGO Central 6680
CLEVELAND Superior 6159
DAYTON Madison 5361
DETROIT Walnut 1-3101
ELMIRA 5168
ERIE 5-4375
GREENSBORO, N. C. 2-0608
INDIANAPOLIS Franklin 3508
LOS ANGELES Trinity 9826
MIAMI 3-2384
MONTREAL MA 5346
NEW YORK Worth 4-7484
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in Tool Steel Quality!

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Trends In Modern Milling Machines

By A. O. Schmidt

KEARNEY & TRECKER CORPORATION

ADVANCES IN THE technique of carbide milling, so much promoted during the war, brought into sharp focus the realization that milling machines available in the shop are oftentimes inadequate for high production requirements. The erroneous impression, created by many early, enthusiastic reports, that even the most difficult steel milling jobs could be "licked" by using negative-rake-angle carbide cutters at very high cutting speeds, has not yet been completely eradicated. However, several important results have come out of the experience with the production of war materials and the experimental work conducted both in industrial and university laboratories. (1, 2*)

Cutter design and the design of the milling machine are intimately related. Optimum production cannot be obtained with either the combination of a high-powered, well-designed machine and a weak, inadequate cutter or a well designed carbide cutter and an underpowered, insufficiently rigid machine.

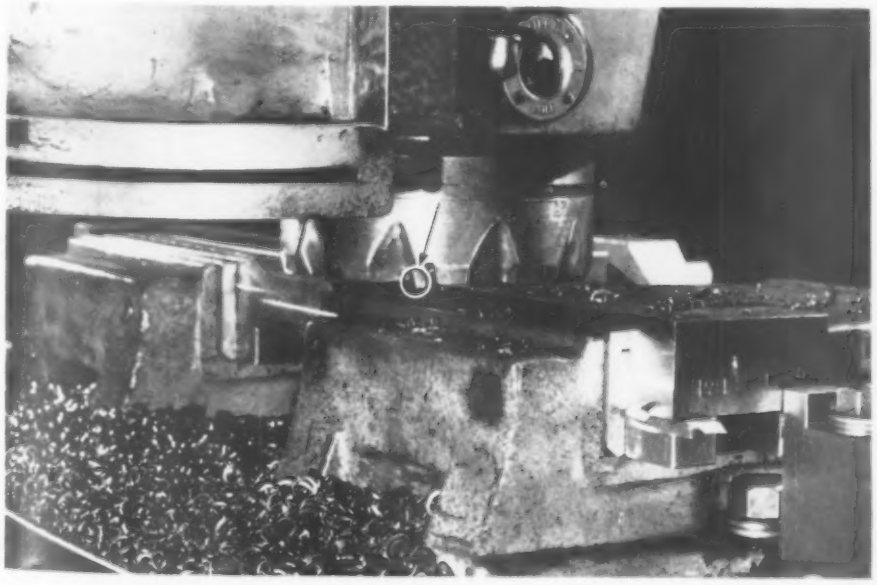
Modern milling machines are the fruit of experience gained in production shops as well as in laboratory research. Some of the main considerations in their design have been the provision of sufficient power and rigidity together with greater feed and speed ranges, safety and ease of operation, proper controls and drive mechanisms, and accessibility for maintenance. Practical cutting speed ranges in carbide milling are approximately as follows: steel, 300 to 700 fpm; cast iron, 200 to 400 fpm; and aluminum and magnesium, up to 20,000 fpm. High speeds applicable to the light metals cannot be used in machining steel and cast iron, because these latter materials require more power per cubic inch per minute. Tool temperatures when machining ferrous materials are also higher, entailing more rapid tool wear.

*Numbers in parentheses refer to bibliography at end of article.

A certain amount of power is required at the cutter to remove a cubic inch of material per minute by milling. The amount of power will depend basically upon the kind of material being cut and its microstructure. Feed per tooth and the cutting angles on the blade or tooth will exert a certain influence. No noticeable changes in power consumption will be caused by a change in the tool material used for the cutting edge, whether it be high speed steel, cast alloy or carbide, or by application of a cutting fluid (3). However, a cutting fluid will frequently increase tool life in terms of pieces completed per grind of cutter and may often improve the finish.

Horespower required in a milling operation is composed of the power needed for actual cutting or metal removal and the power needed to overcome friction in the spindle and feed mechanisms. For best performance, these power requirements should not exceed the rated horsepower of the driving motors. Both the machine and the motors will permit operation above rated loads for short periods of time, but it is not good practice to operate at sustained overloads.

Reliable data on the power required at the cutter to mill a representative group of metals have been gathered and used in the preparation of Table I. These tabulated horsepower values include efficiencies of various milling machine drives and are based on a cut $\frac{1}{8}$ in. deep and a feed per tooth (chip load) of 0.010 in. taken with a cutter having 0 deg axial rake (helix) and 0 deg radial rake. A 10 deg negative rake angle effective at the cutting edge will require approximately 10 percent more power than one of 0 deg. Power will decrease at about one percent per degree increase in positive rake angle. If the feed per tooth is more than



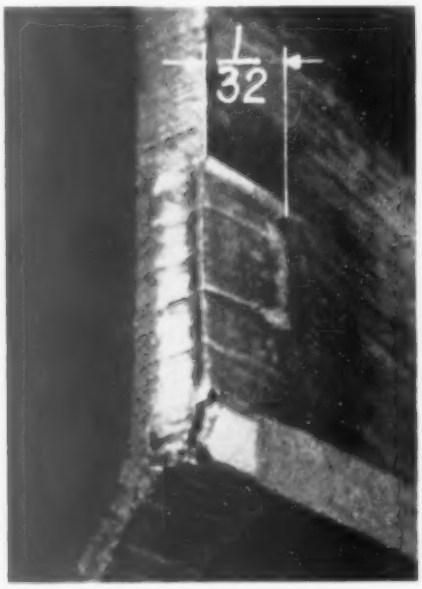


Fig. 1, left. Milling a heavy shear blade with a carbide cutter at a cutting speed of 450 fpm and 31 ipm feed. The cutter has solid carbide tips positioned at a 15 deg pos. radial rake angle which can be easily adapted to milling various materials. A large chip space is provided in front of the tooth which guides and shapes the chip. The encircled part of the tooth is shown in Fig. 2. Fig. 2, right. Wear of carbide tip. Should be reground at this stage.

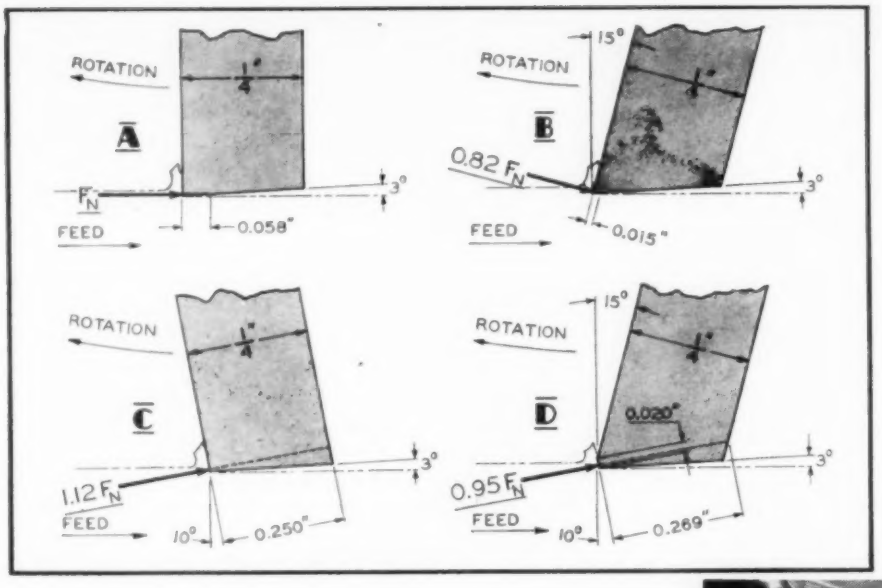
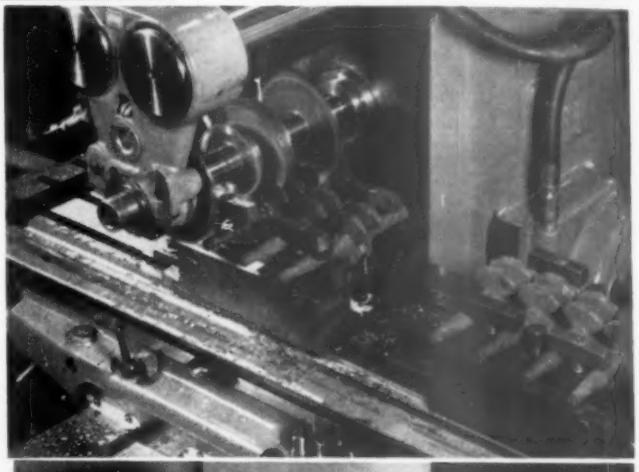


Fig. 3. Different radial rake angles for milling cutters.

A = 0 deg
C = 10 deg neg
B = 15 deg pos
D = 15 deg pos and 10 deg neg
0.020 in. wide at cutting edge

Note how C and D put the carbide under compression and provide more material in line with the force Fn. Blades in cutter of Fig. 1 are arranged as shown in D above and have often proved to be highly satisfactory.

Fig. 4. The automatic cycle and two fixtures increased production.



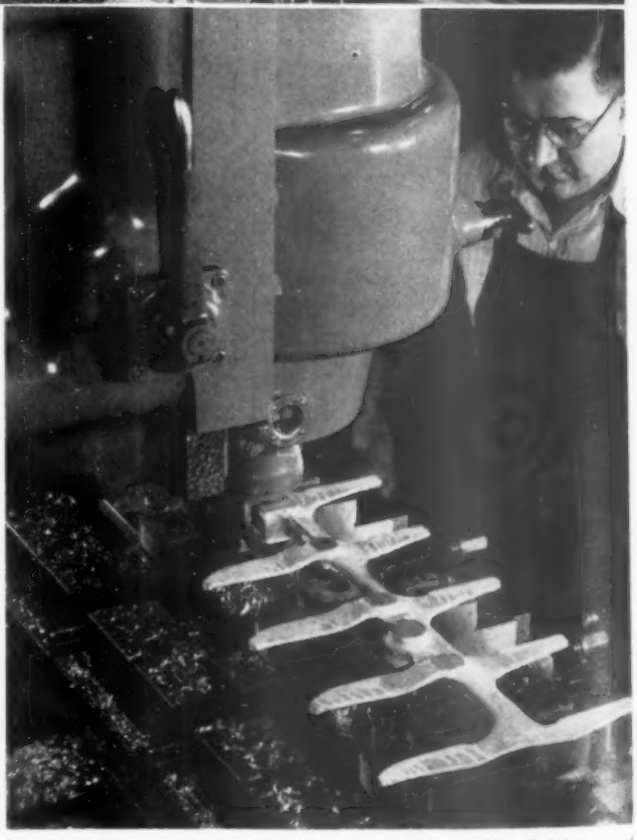


Fig. 5. Milling an aluminum forked rod on chucking table. Cutting speed 2200 fpm, feed 90 ipm. The jaws can easily be relocated for holding other workpieces.

0.010 in., the value of hp per cu in. per min. will decrease slightly. On the other hand, this power may increase 20 percent or more if the feed per tooth is reduced to 0.002 or 0.001 in. Usually, a fine chip is the least economical with reference to both horsepower per cubic inch per minute and tool wear. The power value will decrease a little with a greater depth of cut and will increase slightly with a more shallow cut.

It should be remembered that in long production runs cutters wear constantly and get dull. This wear, even when no breakage of the teeth occurs, will increase the power requirement, at times, as much as 75 percent before the cutter is changed. For this reason it is inadvisable in most cases to begin machining a large lot of workpieces with an overload on the machine. See Figs. 1 and 2.

Modern milling machines are built to be rigid, and therefore as free as possible from vibration. There are other factors which will influence rigidity of the set-up: cutters, arbors, position of cutter on the arbor, support of arbor, also the design and position of the fixture and clamping of the workpiece itself. These are points which have to be left mainly to the operator and to his supervisor. Many companies, therefore, have found it worthwhile to set up a training program to instruct their key men in the fullest utilization of modern machine tools and cutters.

The performance of an older milling machine can sometimes be improved by the application of a flywheel. However, this should be done only in connection with a general overhaul which eliminates loose bearings and gears. The flywheel must be of proper size and in the right location, otherwise it might damage the machine or cause deflections of the machine members which are detrimental to tool life. Milling machines which have a flywheel incorporated in their design also have special controls for starting and stopping the spindle and feed mechanisms.

Carbide cutters designed with positive radial rake angles and provided with variable small negative rake angles at the cutting edge, were proposed by Kearney & Trecker research engineers several years ago (4). These cutters have found general acceptance in industry and are now made by a number of companies. They permit easy adaptation to steels of various hardness as well as to different materials. They can be operated with less horsepower, longer tool life, and greater economy of carbide material than many other types of cutters. Since they also exert less thrust it has been found advantageous to use them in milling welded steel structures which would deflect and vibrate excessively when milled with ordinary carbide cutters; See Fig. 3.

Fig. 7. Milling a cast steel channel with HSS cutters. Cutting speed 150 fpm, feed 5 ipm. Coolant is one part prepared oil to 40 parts water.

Fig. 6. Milling a steel casting on chucking table. Cutting speed 300 fpm, feed 15 ipm.

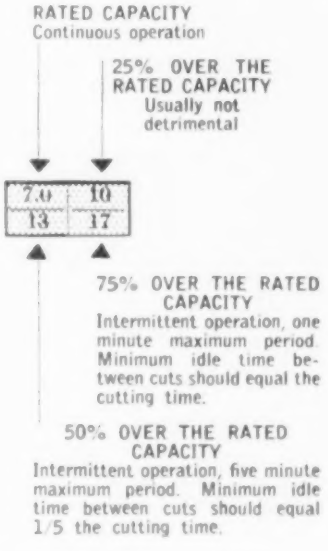
Cutting speeds and feed rates have been increased in most cases to a point at which the actual cutting time on a milling machine is only a small part of the floor to floor time. Reduction of the time for loading, locating, and clamping the workpiece, positioning for cutting, and shifting of levers for starting and stopping is a prime requisite for lower machining costs. The production capacity of milling machines can be greatly increased by automatic pacing of the cutting operation and reduction of cutter idle time by means of automatic table cycles. An automatic table cycle mechanism will make a standard machine more adaptable to volume production, since the predetermined, automatic cycle eliminates many fatiguing motions otherwise required of the operator and fixes the hourly production even in short runs. See Fig. 4.

Worpieces that are not stiff due to their shape or are difficult to hold in ordinary clamping devices can be held easily in a chucking table. Various interchangeable and reversible vise jaws permit wide possibilities of set-up and assure rigid holding as well as quick handling of a great variety of workpiece configurations. See Figs. 5 and 6.

Since certain cutters permit much higher rates of production they often get dull in a shorter time than high-speed steel cutters, but they will produce more pieces per grind of cutter in this shorter period of time. The number of workpieces produced per grind will be dependent upon the cutter design, tool material and machine used. The set-up men should be experienced enough to pick the best feeds and eliminate detrimental factors, such as non-rigid fixtures, loose bearings and ways. If proper attention is given to a carbide milling job, a gradual improvement of the production fixtures will generally be noted. Careless handling of carbide cutters, improper grinding, selection of the wrong grade of carbide, or running carbide cutters until they flake or chip will make this type of milling uneconomical.

Post-war milling machines are built for the severe requirements of carbide steel milling. However the increased power and rigidity of these machines also improves the performance of HSS cutters and those of cast alloy materials. These latter materials are by no means obsolete. They too have been improved during the last few years and a wide variety of grades are available. Milling machines with high rigidity and power reserve will permit the operation of HSS cutters at higher rates of feed and speed with an increase both in pieces per hour and pieces per grind of cutter. See Fig. 7. In form milling, especially, HSS and cast alloy cut-

Material To Be Milled	Rated Horsepower of Milling Machine																	
	Without Separate Feed Motor												With Feed Motor					
	3		5		7.5		10		15		20		20		30		50	
	Maximum Metal Removal Cubic In. per Min.																	
Aluminum	2.7	4.9	5.5	7.6	8.7	12	12	17	18	26	27	38	30	41	49	65	91	118
	6.0	7.1	11	14	16	21	23	28	35	44	49	60	52	63	81	100	145	173
Brass—Soft	2.4	4.2	4.7	6.6	7.5	10	10	15	16	23	24	33	26	36	42	57	79	103
	5.2	6.1	9.4	12	14	18	20	24	30	39	42	52	46	55	71	87	126	150
Bronze	1.7	3.0	3.3	4.7	5.3	7.3	7.3	11	11	16	17	23	19	25	30	40	56	72
	3.7	4.3	6.7	8.7	10	13	14	17	21	27	30	37	32	39	50	61	89	106
Bronze—Hard	.78	1.4	1.6	2.2	2.5	3.4	3.4	5.0	5.3	7.5	7.8	11	8.7	12	14	19	26	34
	1.7	2.0	3.1	4.0	4.7	5.9	6.5	8.1	10	13	14	17	15	18	23	29	42	50
Cast Iron—Soft	1.6	2.9	3.2	4.5	5.2	7.1	7.1	10	11	15	16	23	18	25	29	39	55	71
	3.6	4.2	6.5	8.4	9.7	12	14	17	21	26	29	36	31	38	49	60	87	103
Cast Iron—Hard	1.0	1.9	2.1	2.9	3.5	4.6	4.6	6.7	7.0	10	10	15	12	16	19	25	35	45
	2.3	2.7	4.2	5.4	6.2	7.9	8.7	11	13	17	19	23	20	24	31	38	56	66
Cast Iron—Chilled	.78	1.4	1.6	2.2	2.5	3.4	3.4	5.0	5.3	7.5	7.8	11	8.7	12	14	19	26	34
	1.7	2.0	3.1	4.0	4.7	5.9	6.5	8.1	10	13	14	17	15	18	23	29	42	50
Malleable Iron	1.0	1.9	2.1	3.0	3.4	4.7	4.7	6.8	7.3	10	11	15	12	16	19	25	36	46
	2.3	2.7	4.2	3.5	6.4	8.1	9.0	11	13	17	19	23	20	25	32	39	57	68
Steel—Soft	1.0	1.9	2.1	2.9	3.3	4.6	4.6	6.7	7.0	10	10	15	12	16	19	25	35	45
	2.3	2.7	4.2	5.4	6.2	7.9	8.7	11	13	17	19	23	20	24	31	38	55	66
Steel—Medium	.78	1.4	1.6	2.2	2.5	3.4	3.4	5.0	5.5	7.5	7.8	11	8.7	12	14	19	26	34
	1.7	2.0	3.1	4.0	4.7	5.9	6.5	8.1	10	13	14	17	15	18	23	29	42	50
Steel—Hard	.56	1.0	1.1	1.6	1.8	2.5	2.5	3.6	3.9	5.4	5.7	8.4	6.3	8.6	10	13	19	25
	1.2	1.4	2.2	2.9	3.4	4.3	4.7	5.9	7.3	9.2	10	12	11	13	17	21	30	36



To select a milling machine having sufficient power to remove 7 cubic inches per minute continuously of SAE 1020, Bhn 170, read down the material column to Steel-Soft; read right to first number equaling or exceeding 7; read up to horsepower rating. To remove soft Steel continuously at the rate of 7 cubic inches per minute a 15 horsepower machine should be used.

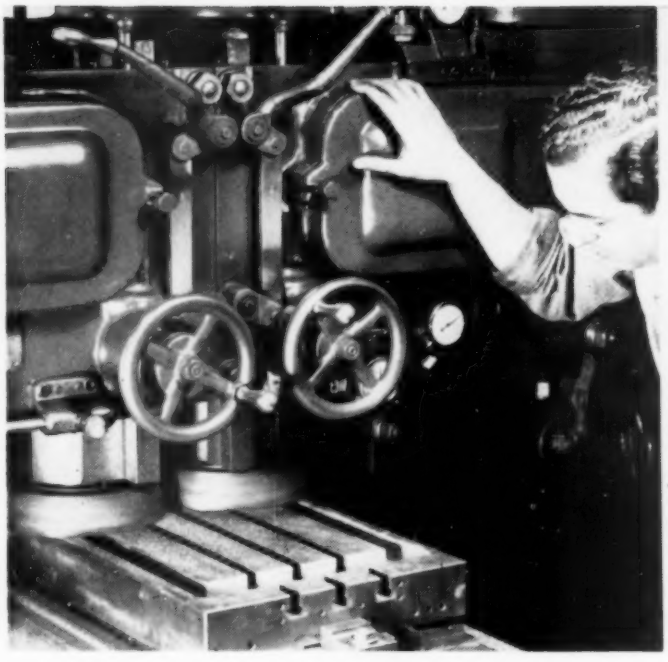


Fig. 8. Finishing a CI milling machine table. Cutting speed 300 fpm, depth of cut 0.020 in. Feed per tooth 0.002 in.

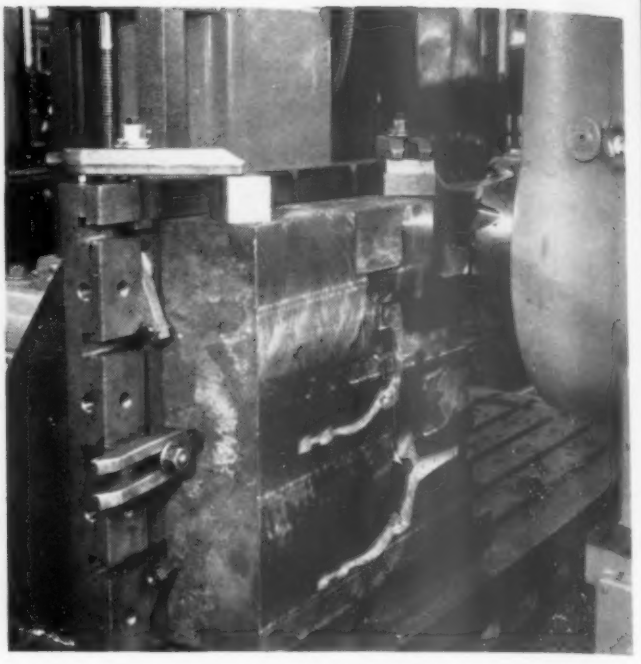


Fig. 9. Milling a used forging die block on bed-type machine. Material hardness, 400 Bhn plus additional hard spots. Cutting speed, 100 fpm.

ters are preferred because they can be more easily shaped and reground. Sometimes carbide cutters and HSS cutters have to be run together in a gang on the same arbor. One grade of carbide has been developed to operate at typical HSS cutting speeds because many carbides will flake and chip when run at low cutting speeds.

Since surface finish will generally be improved by higher cutting speeds, it is possible to mill even bearing surfaces with a sufficient degree of accuracy and flatness. A reduction in the feed per tooth, within limits, will also serve to improve surface finish. See Fig. 8. It is therefore often advisable to set up the milling operation with the surface requirements in mind. For example, a heavy steel milling job with a carbide face mill, using a feed of 0.015 in. per tooth, a cutting speed of 350 fpm, and 0.300 in. depth of cut will have a comparatively rough surface finish of about 80 microinches (rms), profilometer reading. If a better finish is desired, a feed of 0.005 in. per tooth, a cutting speed of 500 fpm, and only 0.060 in. depth of cut would result in a surface finish of about 20 rms, profilometer reading.

The hardness of the workpiece material can be taken as an approximate index in arriving at preliminary estimates of feeds and speeds. Steel of 200 Bhn may be cut advantageously with a carbide cutter at a cutting speed of 400 fpm and a feed per tooth of 0.010 in. The same material heat treated to 300 Bhn would require a reduction in cutting speed to about 300 fpm and in feed to about 0.008 in. per tooth. When the hardness is increased to 400 Bhn the machining problem becomes more difficult (5). Not only is it necessary to decrease the cutting speed to about 140 fpm and the feed to 0.004 in. per tooth, but the machine requirements become more stringent. Resurfacing of used die-blocks requires bed type machines of highest rigidity operating at relatively low feeds and speeds. See Fig. 9. For economical use of carbide cutters, resharpening should take place when the cutter has worn 1/32 of an inch on the periphery. This can easily be measured by the operator with a scale. Attempts to run cutters beyond this point may cause more breakage and, in any case, will make regrinding more expensive with insufficient additional production to justify the increased expense.

The modern milling machine cuts metal in fundamentally the same way it has been done since man first started to use machinery to fashion more of his needs in metals. The metal cutting process, the separation of the metal by a harder material, is still the most important action of a machine tool. New and improved workpiece materials, having high strength properties, together with large volume demands have made this operation more difficult. It is in the small region at the cutting edge, a few thousandths of an inch in depth and length, that most of the mechanical power supplied to a machine tool is used up in the "cutting" process (6). A stronger workpiece material requires more power per cubic inch removed per minute, which also means that more heat is generated in the tool, chips, and surface of the workpiece. The milling machines of today have been built to stand up under continuous production requirements. Many factors contribute to a successful, economical milling operation, not the least of which is the correct application of engineering principles to the complete tooling of the machine in the shop. As yet, no "wonder" cutting fluid, no "miracle" tool material, no "atomic disintegrator" or "magic angle" has been discovered which will automatically result in high, accurate production and do away with the exacting requirements in machines, tools and setup.

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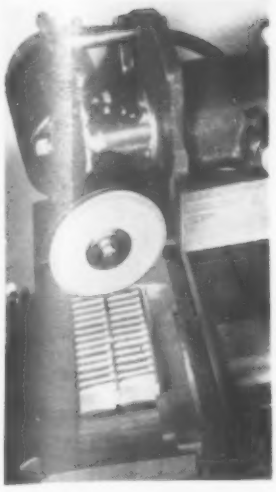

Perspectives of Broaching

By John A. Markstrum

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THE UNIVERSAL USE of broaching has been developed mainly within the last quarter of a century, and therefore is one of the newest methods of machining. In this short space of time the concentration of effort has established it as a permanent art, with few basic changes within the last decade. Nevertheless it is always subject to new ideas and new applications. To the present the economic side has been partly overshadowed by enthusiasm of discussions regarding technique.

Broaching has gained in popularity over a number of years, with more and more installations made covering a diversified range of work. No art can be enhanced, or even survive, without urgent need for its existence. What then, prompts this increased demand for broach installations? An analysis reveals that the necessity for broaching falls into three main categories, each having distinctly different advantages and yet capable of combination.

1. The kind of work that is not readily processed by methods other than broaching regardless of quantity. Those usually are odd shaped slots and regular or irregularly shaped holes.

2. Parts that are broached to obtain either high degree of accuracy, smooth surface finish, or both.

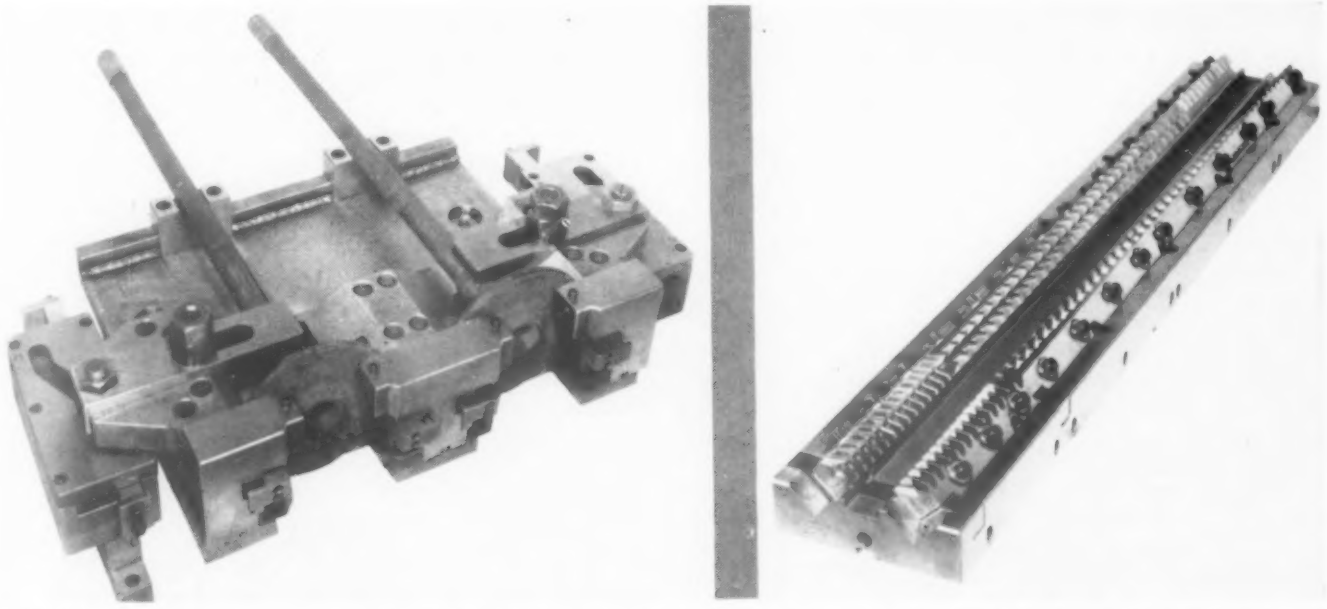
3. Mass production of parts broached for economical reasons only. This group includes both internal and external work. Uniformity of size and good surface finish, whether required or not, are obtained gratis.

Items one and two are self-explanatory, while item three is more intriguing, as it has a greater bearing on our economy than the first two. The year 1948 saw increased compensation to labor while we were feeling the effects of increases in prior years. Manufactured commodities increased in price beyond the take-home pay of the worker without enriching the manufacturer. He also must have larger income to replace worn or obsolete equipment at higher prices than formerly. Reduction of production costs offered the only apparent solution and broaching was one of the methods used to effect economies.

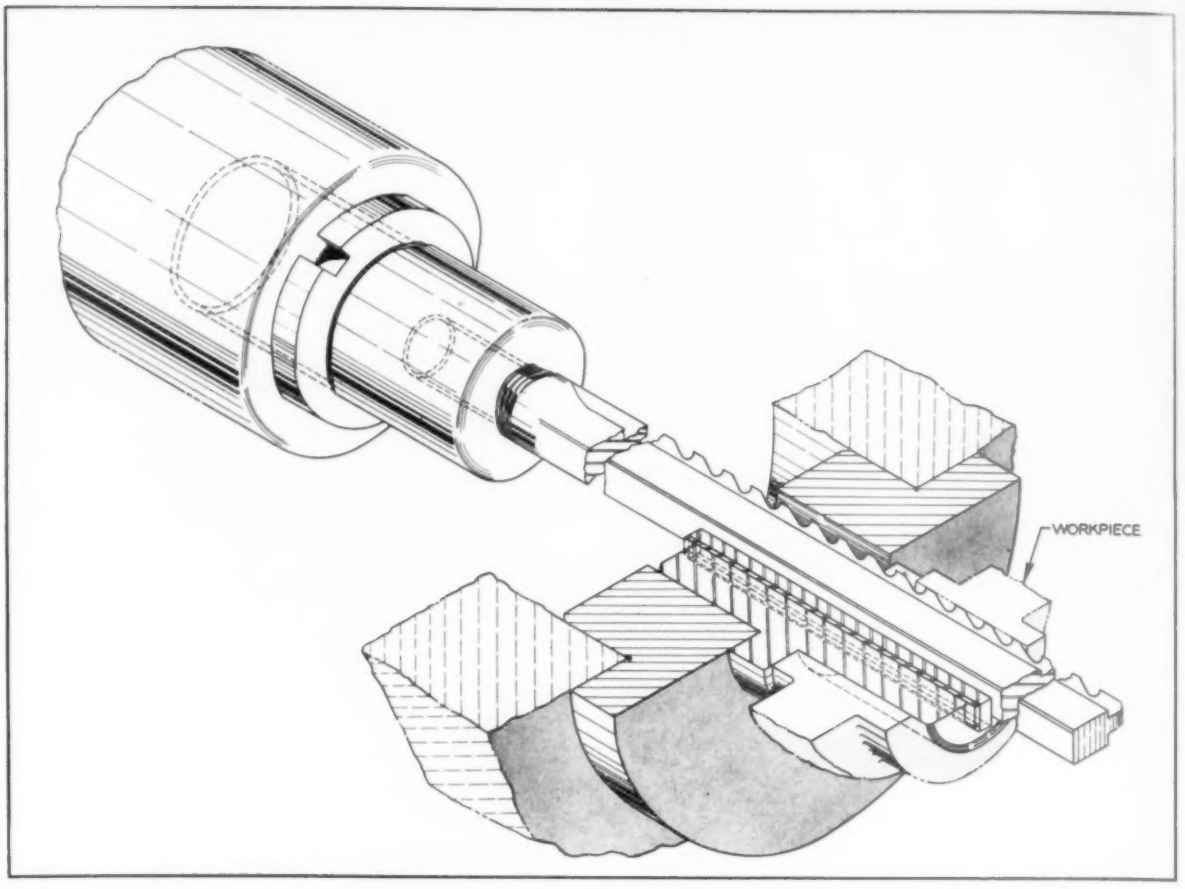
Last year saw great strides in automatic clamping and unclamping the part in broaching fixtures to eliminate fatigue of the operator, as well as to obtain greater productivity from the installation with the least amount of effort. Hydraulic and air cylinders were employed, while in other installations mechanical devices actuated by shuttle stroke of machine table locked and unlocked the clamps.

Streamlining of fixtures for appearance and cleanliness is stressed more than ever. Of more importance is the resultant safety and convenience for the operator. Ease of loading speeds the operation and lessens fatigue. All these points are thoroughly studied in the design. They are important factors in reducing toil, lowering prices of commodities produced and raising the morale of operator and foreman.

The natural reaction is one of apprehension regarding cost. However, as an illustration let us consider a concrete example. With present equipment a manufacturer produces



(Left)—This fixture with automatic clamping is used in a vertical surface broach machine in broachng a slot across the flanged end of automobile rear axle shafts. Two parts are broached at one time; the clamps are advanced and locked by the shuttle stroke of the machine table, unlocked and withdrawn when the table stroke is reversed. (Right)—Holder and broach inserts used in surface broaching for roughing and finishing cast iron machine dovetail slides in one pass from a rough casting. Tooth development here is such that it penetrates the abrasive scale with the least amount of broach wear.



Typical keyway broach installation, showing general arrangement of tooling. This is one of the earliest forms of broach tooling.

parts at the rate of 150 pieces per man-hour. Broach equipment costing $2,000 could produce 300 parts per man-hour. Labor and overhead at $4.00 per hour for 2,000 work hours in a year is $8,000. By doubling the machine capacity he saves the cost of one of the two operators, or $8,000. Deducting the cost of broach equipment he has a net saving of $6,000 the first year. Such savings permit lowering the price on his product.

Broaches run longer between grinds than do cutters as each tooth contacts the part only once whereas each tooth of a milling cutter engages the work many times. The broach therefore requires less frequent sharpenings, resulting in longer tool life and less down time for changing the tools, resulting in additional savings.

The figures given above describe one set of conditions. However, it should not be taken for granted that broaching in all cases doubles production. It depends greatly on the nature of the work. In other words the ratio could be not as great in some cases, while considerably greater in others.

Most machining operations are calculated in terms of feed in inches per minute. Hence the longer the part the longer it takes the tools to traverse its length. In broaching the time of cut is virtually the same for a long or a short cut, provided that its length is not beyond broaching possibilities. Specifically, one stroke of the broach completes the operation whether the part is long or short. A slight increase in time is noted on very long parts, when the broach, and therefore the stroke, must be lengthened correspondingly.

The art of broaching is constantly being improved. More knowledge is accumulated. Improvement in design make many shortcuts possible. During the last war a heart shaped hole required three draws with broaches guided in the fixture. These were of such intricate design that they almost defied the combined efforts of the engineers and shop mechanics to construct.

In the revival of defense products this operation was performed with a single broach of simple construction piloting in the part with a guide incorporated in the broach. This broach cost about half as much as any one of the three pass broaches and did the same work in a single pass, with a faceplate adapter rather than the expensive fixture formerly used.

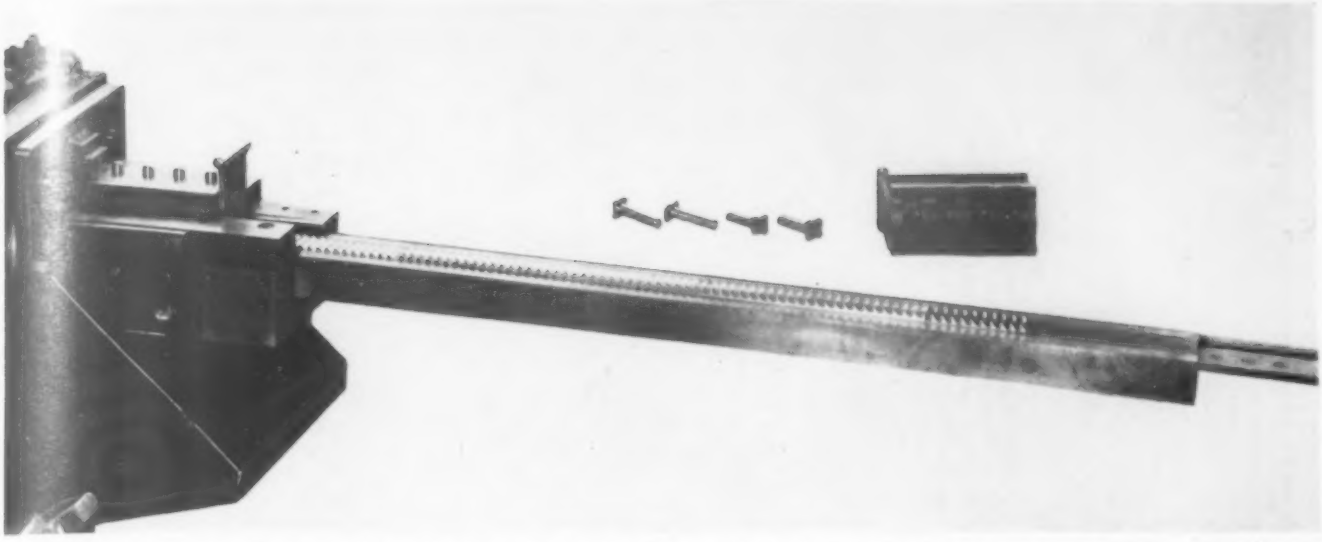
Design is the most important single step in producing a broach or broach equipment. It controls all subsequent operation including selection of materials, heat treatment and inspection. If the design is wrong, no amount of skill can overcome the shortcomings and a broach once hardened and ground offers little or no chance for alterations. It is then an object of much profanity, and ends up in the scrap barrel.

A sales manager once stated that all that was needed in a manufacturing plant was the sales and inspection departments. Broach manufacturing appears to be different, as a broach will "talk back" if any intervening departments do not adhere to the straight and seemingly unduly narrow path.

Heat treatment of broaches has undergone a number of changes. Added equipment such as special long furnaces, electrical heat controls, hardening and tempering baths reduce the heat treatment to a science, rather than the game of chance of former years. Steels from which broaches are made are carefully selected, are of uniform quality and usually respond to proper heat treatment, which is a "must".

Broaches as made today are generally ground all over. Due to their shape and length they require a number of special machines capable of high accuracy. Improvement in these machines has been constant, as accuracy is the keynote of good performance. Even where no great accuracy in the work is required, the broach must have all its elements in exact correlation, simply in order to function as it should.

Many of us recall the day when broaches were made entirely from carbon tool steel, with the form unground. Allowances were made for shrinking and scaling. If they did not shrink or scale off sufficiently, the hardening process was repeated. A case was reported in which a spline broach was



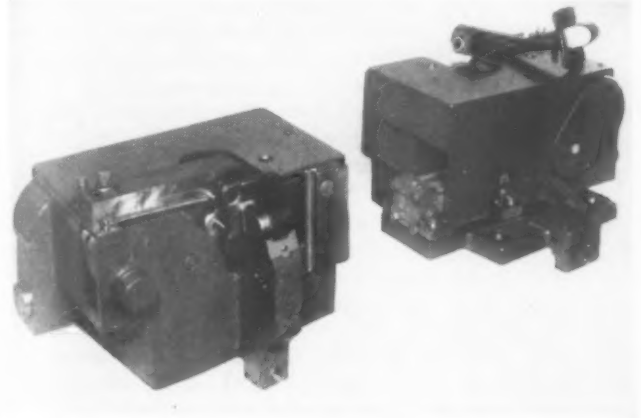
Fixture, holder and broach used for external broaching of a 1½ in. convex radius on bolt heads. In operation four parts are locked in a magazine which is positioned in ways in the fixture. An extra magazine with parts loaded is shown at upper right, and the parts are shown center. The broach equipment is used on a horizontal pull broach machine.

re-hardened six times in order to attain its proper size. Experts during World War I advocated trial cuts with broaches to locate the teeth that cut more than their proportionate share as evidenced by heavy chips. These high teeth were then to be stoned down to their respective size.

The year 1948 saw us emerging from the post-war hysteria, with its re-conversion problems we well remember. We settled down to a saner outlook. Broaches and fixtures were bought on merit rather than first cost. The cost of producing a broach is relatively the same for one vendor as another. The alternative is either a shorter broach or less expensive material.

The only saving to be had in a cheap broach is where small quantities of work are to be produced, in other words, where broach life is unimportant. A broach of proper length will outlast the short one in somewhat direct proportion to the lengths involved. Many examples of this were noted in the depression years, when competition was ultra keen. The temptation of the buyer under those conditions to purchase at the lowest price is readily appreciated. Experience gained in this way showed that the right length broach was the most economical.

Broaching was originated for internal work, such as holes of various forms and keyways. With the introduction of splines the broach was, and still is, the only practical method. The speed and accuracy obtained was a direct invitation to broach external surfaces. Fixtures were then constructed that converted the pull broaching machine into a surface broach. Installations of this kind are constantly being made with excellent results.



The fixture shown above is used in a double ram vertical broaching machine in finishing both ends of king pin boss on an automobile steering spindle. This first operation requires compensating anvils to position and hold the rough forging securely and accurately under the heavy longitudinal and transverse thrusts imparted by the broaches.

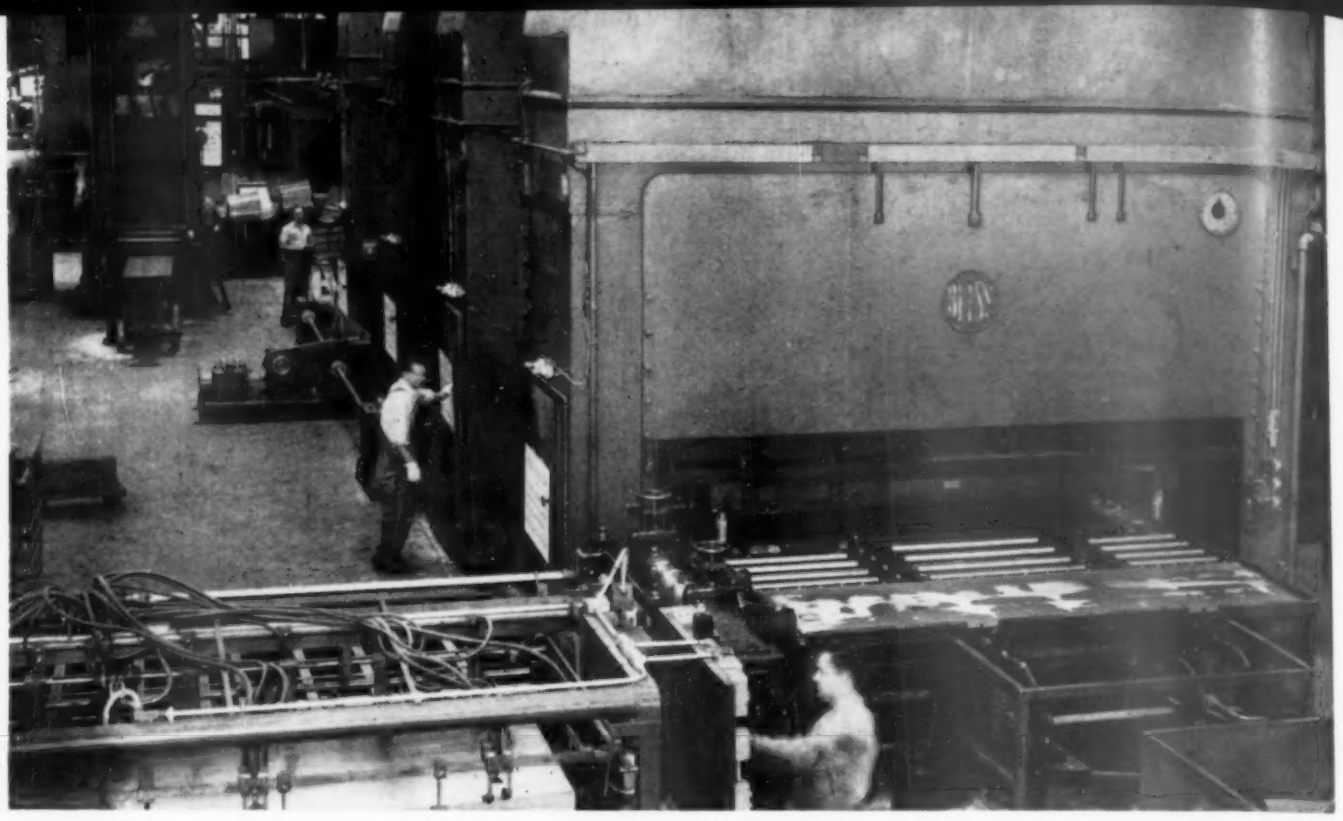
When the nature of the part permits, more than one piece may be loaded into the fixture, which speeds the production. Other shapes may require loading of several parts into a magazine, which in turn is positioned in the fixture. If two magazines are provided one may be loaded while the other is in operation. In other cases a hinged clapper block swings clear of the broaches to facilitate loading and is returned into cutting position by means of an operating handle.

The vertical dual ram surface broaching machine has been found to be both productive and versatile. Either the same operation or different operations may be performed on the two rams. In some instances more than one operation is done on each ram. Good judgment must be exercised, however, in the number of parts loaded, as loading may become awkward and time consuming with little or no benefit. There is also the problem of synchronizing one part with another to maintain close tolerances.

Broach vendors find that quite a few machines are too small to do the work desired. These machines were purchased with adequate capacity for a certain class of work. Ever-changing conditions necessitate larger work to be processed and these machines are available. If tooled for this larger work, or maybe only deeper cuts, the performance is not satisfactory. For this reason it is always well to acquire a machine with considerably longer stroke than actually required at the time, as the stroke always may be shortened but not lengthened. A little extra power will do light operations with a reserve for heavier work, if needed.

The year 1948 showed closer co-operation between user and vendor of broach equipment. This is very encouraging and necessary, as the user knows his problem better than the vendor. Any problem that is accurately solved should be presented with all conditions that are available. A part drawing sent to a vendor merely asking for a proposal is all too common. The vendor should be informed which operations are to be produced and a description of the machines available, along with any other requirements that may exist.

With this information the vendor knows the type of equipment needed, and preliminary layouts may be made as a basis for the estimate. The quantities to be processed determine whether simple or more elaborate tooling is warranted. The vendor's business is to solve the problem to the best interest of the user—quality work in the shortest time.



In this modern press installation the automatic feeder shown in right foreground passes single sheets to a roller conveyor, which takes the blank through a battery of four presses. Through these primary steps in the forming of panels for domestic ranges, human hands need not touch the stamping.
—Courtesy E. W. Bliss Co.

Equipment and Method Trends In Stamping Production

By Harry Sahlin

SAHLIN ENGINEERING COMPANY

As long as industry's objective is to increase production, lower costs and improve safety, the trend to automatic operation will continue to grow. Automatic press operation can take the form of a complete assembly line with conveyors, a multiple die operation or a strip fed single die operation. Even where automatic feeding is impractical, automatic unloading can provide substantial economies.

Due to the sustained large volume requirements of the automotive and related industries, it has been practical for them to utilize automatic machinery to a larger degree than other industries whose manufacturing problems involve more limited quantities. Push button operation of complete assembly lines is, of course, the acme of production perfection. It is no longer possible to say that such methods are not feasible.

Several months ago the trade journals publicized the completion of a new plant which will use the most advanced automatic motive methods in the manufacture of electric ranges. An automatic feeder passes single sheets to a roller conveyor which takes the blank through a battery of large presses which perform the necessary range body-making operations including automatic welding. Human hands need not touch the stampings through these primary steps.

One of the more significant developments in press engineering, is the so called upside-down toggle press on which the ram travels up from the bottom instead of down from the top as on a conventional press. This press, I believe, will take a permanent place in the production of large deep drawn automobile stampings. The presses, which are now being built by the Lima Hamilton Corporation, have several inherent advantages over conventional presses. Length of press stroke is reduced considerably thereby making it possible to increase the number of strokes per minute approximately 75 percent. With the press action from underneath (the plunger draws the shell vertically upwards) the panel is left free on top of the blank holder eliminating the need for intricate liftouts or for operators to dig the part out of a cavity. In most cases it leaves the drawn panel in trim die position whereas conventional presses make it necessary to turn the panel over after its removal. This faster toggle press operation will affect production rates of all succeeding operations in many instances. Steps must be taken to improve other operations in the line to keep pace with the improved toggle press production. I believe that in the near future most automobile builders will adopt the upside-down press construction because of its production efficiency, particularly in new plant construction where they make a fresh start.

But what about the smaller manufacturers who cannot make large investments in new press equipment and conveyors and who have no plans for new plant construction? Often times they must compete with the large volume producer. Of necessity they must resort to less expensive auxiliary equipment and encourage the ingenuity of the tool and die engineer. I have observed in smaller plants countless examples of remarkably clever press and die applications that are not to be found in any handbook or catalog. Savings in

time, money, and material on a single press job can easily run into thousands of dollars and often decide between profit and loss of operation.

A problem common to large and smaller volume producers is the need to utilize full production possibilities of capital equipment. Idle time should be reduced to an absolute minimum. The manual removal of medium and large size stampings from a press generally retards press output. In extreme cases production is reduced 100 percent. This is true even in the most efficient mass production manufacturing plants. The development of an entirely self-contained "Iron Hand" aroused considerable interest among press users, large and small. It is applicable to welders, brakes and shears as well as almost any type of press, mechanical and hydraulic.

Portable and almost foolproof in operation, the device has received the commendation of safety engineers as it minimizes the possibility of accidents. Automobile manufacturers were first to utilize this automatic unloader. It is impossible to predict a specified amount of production increase in view of the many variables in different stamping jobs.

In another plant the need to dig a part of the die caused lost seconds on each press stroke. As the unloader can lift the panel vertically upwards out of the die, production can be increased. The device starts removing the panel the moment there is sufficient clearance between the upper and lower die. With large panels it has been often necessary to have a second crew of men to turn the panel over for right side-up feeding into a trim press. This operation is also eliminated as the "Iron Hand" turns the panel over naturally. When it is undesirable to turn a stamping over, adjustments can easily be made to prevent it. In one case the device was arranged to carry a stamping 14 feet to the next operation by providing a longer arm.

Harry Sahlin is a veteran of 30 years executive experience in the engineering and production phases of the pressed metal industry. A graduate of the Lowell Institute at the Massachusetts Institute of Technology, he was associated successively with General Electric Co., Briggs Manufacturing Co., Edward G. Budd Co., Fisher Body Division and E. W. Bliss Co. In 1947 he resigned from Bliss and formed the Sahlin Engineering Co. to specialize in the design and manufacture of the Sahlin "Iron Hand" and other special handling devices. A government consultant, he also serves the National Security Resources Board as expert on the metal forming machinery industry.

Some manufacturers want to know if two stampings can be removed simultaneously where double dies are used. The answer is yes, usually by means of two jaw assemblies on a single unit. Two complete unloaders are then mounted on the same press if necessary. Panels can also be swung out at an angle if desired. Another manufacturer asked how heavy a sheet can be handled. Blanks for automobile roofs measuring approximately 64 in. x 115 in. and weighing approximately 75 lb. can easily be automatically unloaded. At the present time there is only one size unloader and it will take parts up to 80 in. x 120 in. weighing up to 150 lb. On many installations the unloader will remove stampings from the top of the blank-holder surface without the aid of lifters in the lower die.

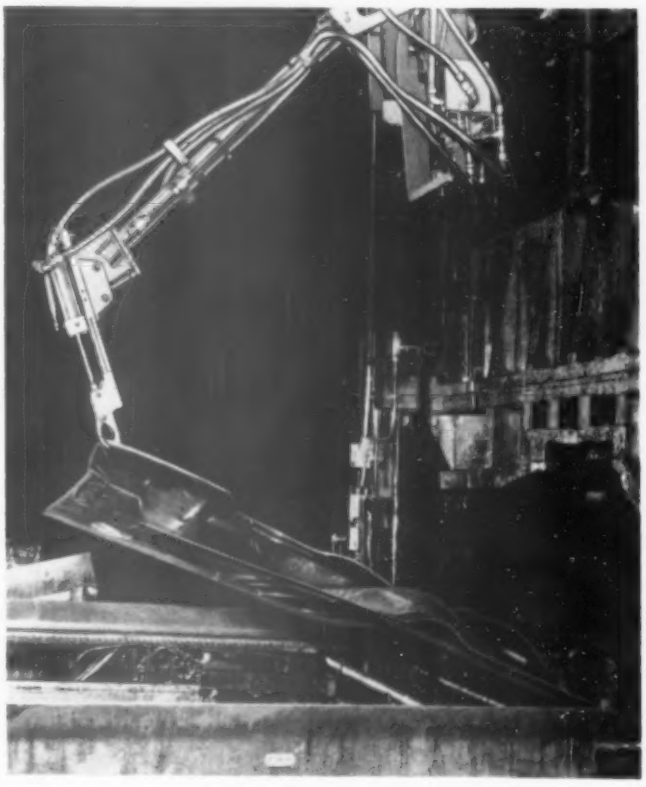
Manufacturers of pressed metal products should investigate the economies available to them by mechanizing their unloading operations. Another cost cutting opportunity is automatic feeding. Steel, aluminum and brass mills are being called upon to supply stamping companies with a larger percentage of coil stock than ever before. Roll feed presses are common today even for large stampings. Reduced scrap loss is equally as important as increased production. Progressive dies, which eliminate handling between stations by performing as many as twelve operations in one press, is another production method which furnishes worthwhile economies.

Aircraft builders now require much larger and heavier presses to blank form, draw and squeeze heavy gauge specially heat treated alloy metals used in military planes which travel at much greater speed than pre-war aircraft. Presses with bottom stroke capacities up to 70,000 tons are predicted.

Stamping companies with the aid of better sheet steel, stainless, etc., are eliminating operations in deep draw work. Tubs and other deep drawn articles that formerly necessitated two draw operations can now be drawn in one stroke of the press.

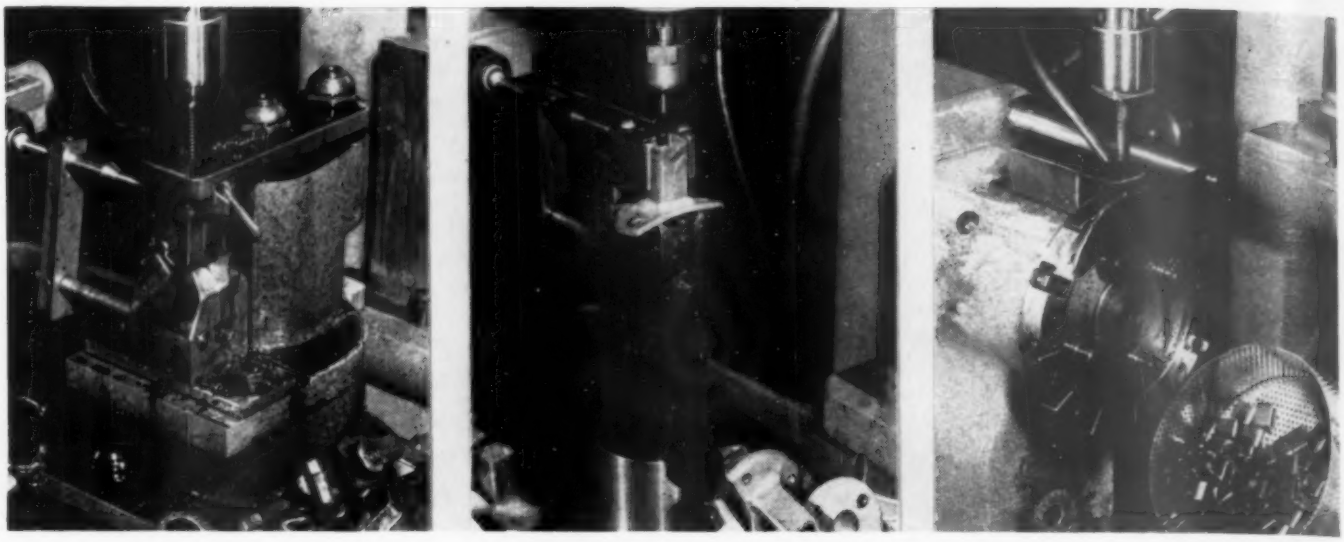
The tool and die engineer of today is also alert to the possibility of converting parts made from castings and forgings into stampings. During the past two years agricultural machinery manufacturers alone have redesigned 150 parts from castings to stampings. The automotive industry uses more stampings than ever before. Over 50 percent (8,000 parts) of an automobile are produced on power presses. Before the war only a very small percentage of bath tubs were made of sheet metal whereas today approximately 25 percent are stamped. The cast iron tub weighs 350 lb. as compared with the stamped tub which weighs 125 lb. The savings in metal and freight rates are obvious. The Pressed Metal Institute, an association of stamping companies, has hundreds of case histories in its files which attest to the possibilities for further economies in this field.

All in all, the return of the buyers' market at a time when industry is confronted with the highest operating costs in its history will make the role of the tool engineer of greater importance than ever before.



Another materials handling development for the press room—the Iron Hand—is shown here as it lifts a formed section from the press bed as the ram rises.

—Courtesy Sahlin Engineering Co.



(Left)—Tapping 3/8-16 through hole in forged copper. Spindle speed is 850 rpm: gross production 1200 pieces per hour using an air clamping fixture. (Center)—Using post type fixture to tap through hole 3/8 in. deep in aluminum die casting. Fixture has micro switch control and automatic ejector. Two-flute spiral point tap used. Speed is 2200 rpm; gross production 2600 pieces per hour. (Right)—Tapping 1/4-28 to 1/2 in. depth in upset copper. Automatic indexing drum dial is used. Spindle speed is 1375 rpm; gross producton is 2400 pieces per hour.

Review of Tap Design and Operation

By Herman Goldberg
SNOW MANUFACTURING CO.

MORE PROGRESS HAS been made in tapping in 1948 than in the previous twenty years; and there is further indication of greater strides to come. This conclusion is based on many years of close observation and experience in this field.

There is good reason for this progress—during the war, the constant demand for more production, better fits, and greater degrees of interchangeability, placed an ever increasing burden on industry to change from time-worn methods, and caused a more rapid recognition and general acceptance of fundamental concepts that had developed. After a war, industry has the time to consolidate the knowledge gained. The return to competition furthers the need for this information, and it is at such a time that progress becomes apparent.

Tapping speeds have been increased to a point where the tap can perform its work efficiently. Originally carbon steel taps had required slow speeds, and the advent of high-speed steel taps was not accompanied by any appreciable increase in recommended tapping speeds. A high-speed steel tool operating at carbon steel tool speed is inefficient—not only from production viewpoint, but also when tool life is concerned. Better tapping machines and tap heads are now available to allow the use of these higher speeds. A few organizations are now publishing speed charts for the various sizes of taps and types of material to more widely promote the use of proper speeds for tapping.

Present-day taps and precision tools require the use of precision machines and spindles. Previously it was not uncommon to see these taps run out as much as 1/8 in. Taps were held with set screws, sleeves, and floating holders—machine spindles were sloppy and bearings were inadequate; yet attempts were being made to tap to close tolerance. More and more manufacturers are installing accurate spindles, collets, and holders since tap run-out is a major cause of excessive tap wear and breakage.

It is very encouraging to see engineers and mechanics making a more thorough study of tap application. They realize that in all material cutting operations, there is no one tool that will be equally efficient on all types of work. The number of flutes, width of land, amount of hook, shear, and chamfer must be properly determined for each job. Many styles of taps are produced by the tap manufacturers for just this reason, but it has always been amazing how many companies would merely purchase taps by size only.

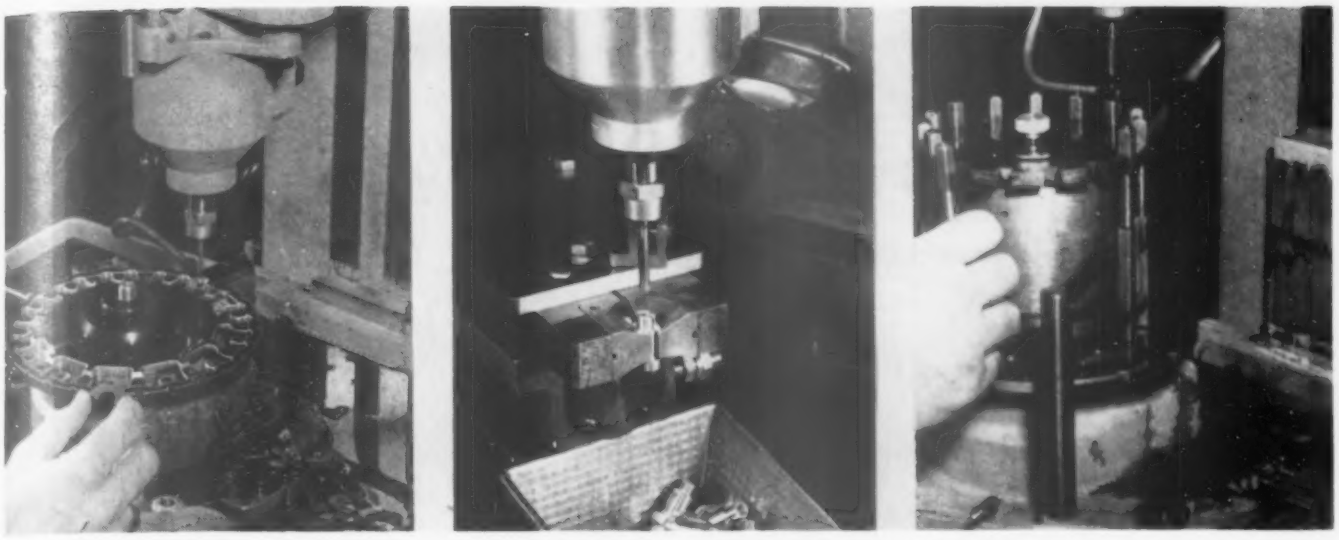
Still another encouraging sign is the more liberal use of high-grade cutting oils. Very little attention had been paid to this subject. Many jobs were tapped dry; some used one kind of oil; others used another; cutting oil was applied directly to the tap with a brush full of chips, dirt, and grit. This acted as a lapping compound, and very quickly ruined the cutting edges of the tap.

The greatest single improvement in tapping has been in jig and fixture design. In the past most fixtures and jigs for tapping were very crude; most of them were too heavy. Little attention was paid to chip room, points of support, and proper location. Alignment was left to the operator. Gradually mechanics and even drill press and tapping machine operators came to realize the importance of proper alignment of the fixture and the tap. If the axis of the hole to be tapped is not lined up properly with the axis of the tap, greater power is required to drive the tap and the possibility of loss of fit is high.

Those crude, cumbersome fixtures with levers, cams, clamps, knobs, and what-not were slow, and production consequently was low. Today the progress made in the design of high-speed fixtures is amazing. While there is no magic in mechanics, the application of common sense and sound engineering principles to fixture design has simplified the construction of fixtures and increased productivity.

It is quite common today to see many automatic and semi-automatic fixtures which operate at the mere touch of a button. In many instances, the part itself initiates the clamping, closing, and ejecting cycle.

The most flexible medium for the control of fixtures is low pressure air. A working knowledge of the possibilities of air clamping is a valuable asset to any tool or design engineer. Air can be used to index, push, pull, turn, clamp, or eject the



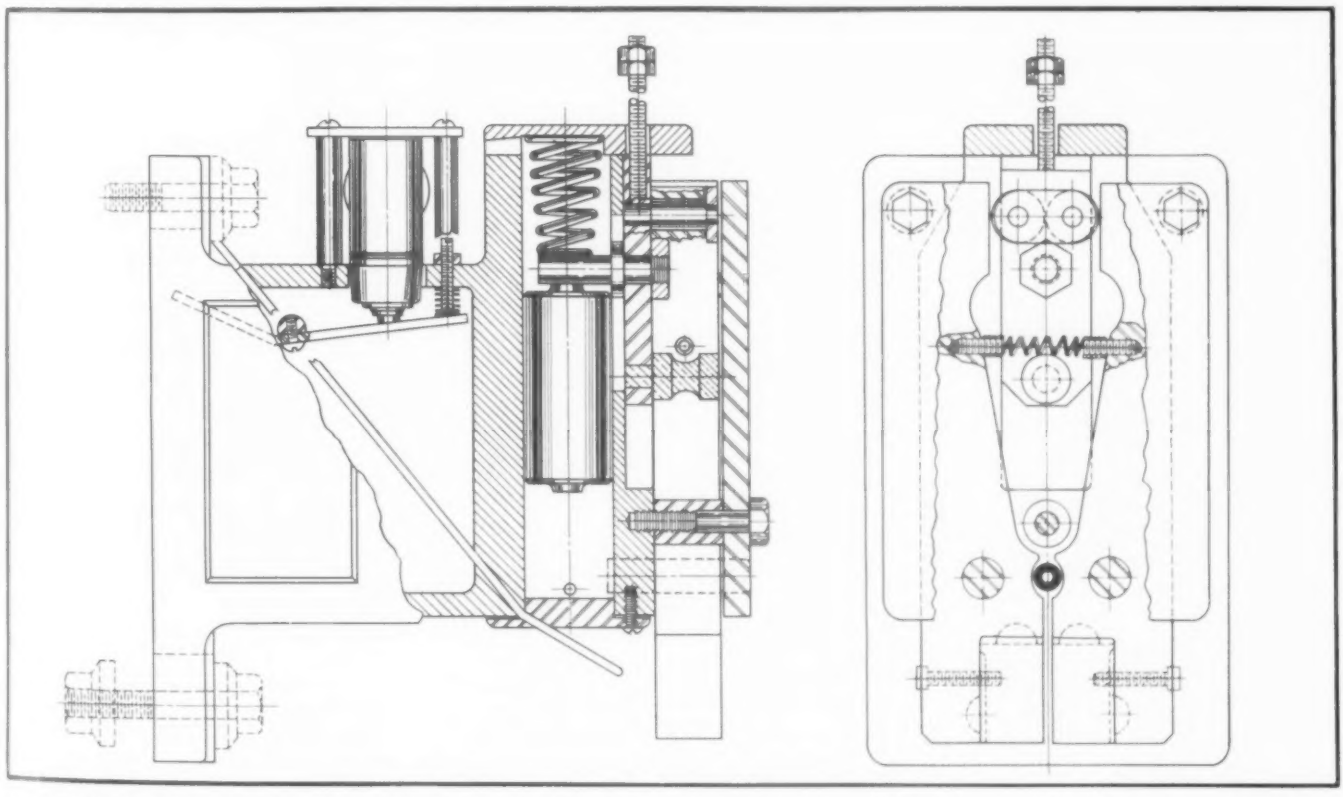
(Left)—Tapping 10-32 through hole in steel stamping. Spindle speed is 2200 rpm; gross production is 2000 holes per hour on horizontal automatic indexing dial. (Center)—Tapping 10-32 in brass on air vise. Spindle speed is 2200 rpm; gross production 1800 pieces per hour. (Right)—Tapping 8-32 to depth of 1/2 in. in SAE 1010 steel. Here a horizontal automatic indexing dial with ejector is used. Speed is 1700 rpm; gross production is 2000 pieces per hour.

work. The application of this type of control is limited only by the imagination of the designer. Many of the new standard air control fixtures which are available cost no more than the old-fashioned conventional type of jig or fixture.

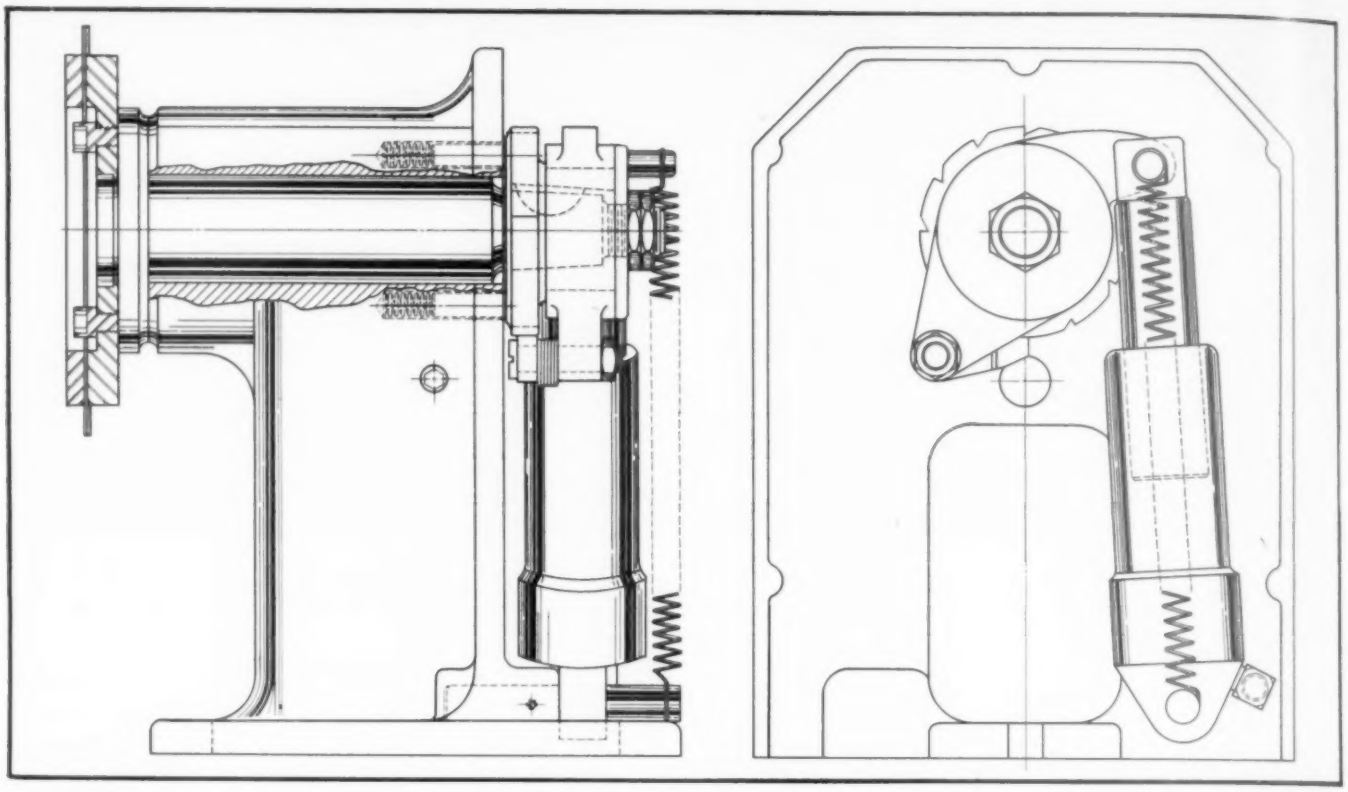
Advances and improvements have been made rapidly during the past year, but there is room for further progress.

Greater care should be taken in the handling of taps in the toolcrib and in the shop. Too often they are thrown loosely in bins and treated roughly. It is quite common to pick up a handful of taps and find that every one of them shows some sign of abuse and neglect. This is also true with a few of the tap manufacturers. Although taps are packed and shipped in protective cartons, the taps themselves show many signs of careless handling prior to packing. This is due mainly to the lack of understanding of the operators, or other employees, and the careless methods that are used in training these men. Suitable respect should be shown when handling a precision cutting tool. A little time spent with the operators in explaining this information certainly will be advantageous to any manufacturer. The cost of the tool in itself is negligible in comparison to the damage that a tool might cause in spoiled work, scrap, etc.

Industry as a whole sees less than 10 percent of the useful life of a tap; 90 percent of the tool life thrown away. This is due to our lack of knowledge of the cutting action of the tap. A better understanding of taps and tapping is required in order to extend tool life. Improper sharpening is perhaps the main cause of short tap life; and the lack of proper sharpening facilities and inability of most individuals to sharpen taps properly is widespread. Few companies have



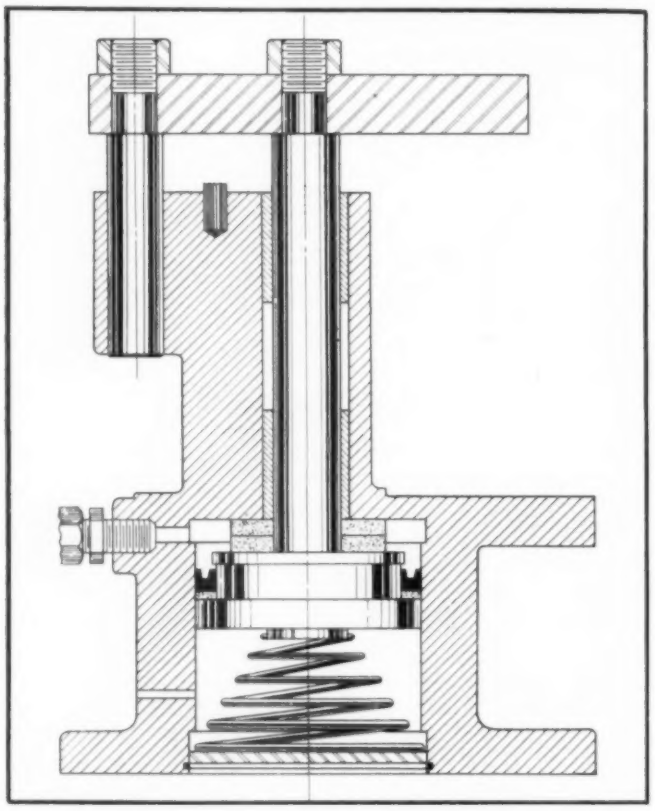
An equalizing-jaw fixture, in which the to and fro movement of the piston opens and shuts the work-holding jaws. As the cylinder opens, the rollers on the slide (shown near the top, right hand view) spread the jaws. On retracting, the rollers line up with the clearance, where a pull spring opens the jaws. Piston return is by means of a compression spring.



Indexing tapping fixture, in which an air-cylinder with spring return actuates a pawl which, in turn, imparts partial rotation to a ratchet wheel. The stroke of the piston coincides with the throw of the pawl for one index, and air pressure is released at the end of the stroke, permitting piston to recede by pull-spring action. The illustration shows principles of operation.

good facilities for re-sharpening taps, yet they have excellent equipment for re-sharpening broaches, milling cutters, boring bars and other tools. Some companies even go so far as to throw away economic waste that should not be tolerated.

The proper sharpening of a tap for a specific job need not be an expensive operation if done before the tap has been ruined. Most operators will run a tap until it either breaks the cutting edges, or is worn too much for salvage.



An air-operated "pump jig". The piston rod carries the bushing plate, here shown in "up" position. The work holding adapter is clamped to the anvil. In operation, air moves the piston downward in the cylinder, clamping the workpiece; and pressure is held during the working cycle. As the air is discharged the spring shuts, the cylinder, raising the bushing plate.

A few companies have set up limits for the number of holes tapped before re-sharpening is required. This pays big dividends in increased tap life and better work. The biggest problem is to get an operator to take out a tap when it becomes dull, and this can be overcome if the operators are trained properly. Generally, as long as the tap is cutting, and gives a fair tapped hole, it is never removed from the machine. This is particularly true on screw machines, and is one reason why 90 percent of useful tool life is thrown away.

The design of parts requiring tapped holes can be greatly improved, especially where blind holes are concerned. Blind hole tapping has given an endless amount of trouble due to the lack of chip room in the bottom of the hole. Many designers do not realize that they must allow enough chip room in the bottom of the tapped hole so that no chip crowding will interfere with efficient operation of the tap. There is no formula that can be set up as to how deep the hole should be because there are too many variables.

The deeper the hole and the coarser the pitch, the more chip room we must have in the bottom of the hole. For instance, it would be entirely practical when tapping a 10-32 hole, $\frac{1}{8}$ in. deep in mild screw stock to allow 1/16 in. clearance; but if the same 10-32 hole were $\frac{1}{2}$ in. deep, one can readily see that with every revolution of the tap there is an increase in the amount of metal removed. A clearance of 1/16 in. would make the job impossible in this instance.

Some firms have set up a standard of $\frac{1}{8}$ in. clearance beyond tapped hole. This is all right in shallow holes, and fine pitch; but in deeper holes and coarse pitches, it tends to cause trouble. This is particularly true in many die cast jobs. Designers should give more thought to the problem and set up a more liberal allowance.

When some of these problems have been overcome, and further progress has been made, tapping will rapidly be removed from the "difficult" category, and placed where it belongs with every other normal machining operation.

1948 saw successful introduction of inert atmosphere electrodes and portable welders

Arc and Resistance Welding Developments

By E. F. Potter

SCHENECTADY WORKS LABORATORY,
GENERAL ELECTRIC COMPANY

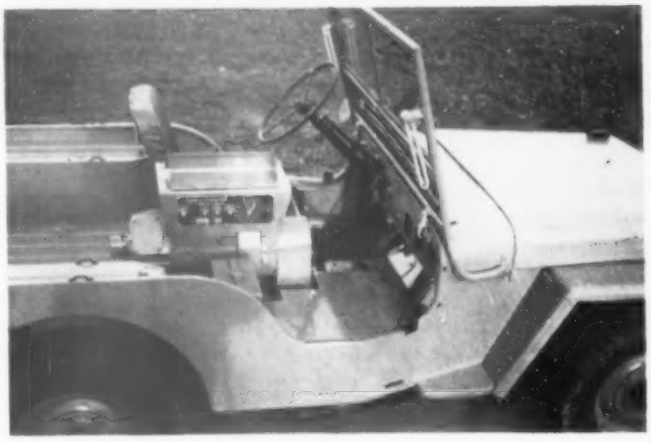
A MAJOR TREND IN arc welding equipment during 1948 was the pronounced move toward lighter weight and more readily portable units for a given output. Greater acceptance was found for small, light, transformer arc welders for farm and home workshop use. Motor-generator sets of about half their previous weight were placed on the market in quantities during the last 12 months. A new light-weight, engine-driven, d-c welder, designed for a wide range of applications, announced last year, weighs only 660 pounds for a maximum of 250 amperes of welding current. It can be carried about on the back of a small pick-up truck leaving ample room for other tools, or it can be mounted on a handy little two-wheeled trailer for even greater portability. This trend toward smaller, lighter units is encouraging, and should continue in the future in the interest of providing the welding user with better and more flexible equipment.

An interesting side-light on this movement toward minimizing the size of equipment was illustrated last year by the novel but wide-spread use of small welding generators on commercial Jeeps.

Electrode development made great strides in 1948 through the wider use of low-hydrogen types of coatings. These coatings have assisted in eliminating cracking of deposits in the welding of many hard-to-weld alloys, and their accelerated use will continue increasingly in the coming year.

One new electrode recently put on the market was designed to meet the need for an electrode with a low-hydrogen coating, manganese-moly analysis, and good usability characteristics. It is well suited for welding most hardenable steels where the hazards of under-bead cracking are to be eliminated. The range of weldable materials for this electrode includes low-alloy, sulphur-bearing, high-carbon, high-manganese, and similar highly-hardenable and high-tensile steels. Another new low-hydrogen electrode, this one with a moly-vanadium composition, can be used with either a-c or reverse polarity d-c to weld a wide variety of low-alloy steels. It is especially suited for welding low-alloy pipe, including carbon moly and chrome-stabilized carbon moly, and new varieties of pipe considered "high tensile". A low-hydrogen, titania-coated electrode of 2½ percent nickel composition can be used on steel castings of a similar analysis and for producing weld deposits having high impact properties at sub-zero temperatures. Its low-hydrogen coating prevents the formation of under-bead cracks which frequently occur when welding hardenable steels with conventional electrodes. Another electrode, recently announced, is designed to deposit extremely hard wear-resisting weld metal in all positions, using a-c or d-c, and is suitable for surfacing dipper teeth, drag line bucket lifts, tractor cleats, roller crusher teeth, mud pump impellers, crane hooks, sand pumps, and sizing screens.

In resistance welding, the use of a constant welding current with an increasing electrode force cycle has been recognized as a good method for improved results, but this method has the objectionable point that the time constant of such a cycle is difficult to control. It has also been known that the rate of current application has a decided bearing on the welding results. The effect of various wave shapes in capacitor discharge welding of aluminum is one example of this. The importance of this characteristic has been indicated by investigations last year which led to the development of a so-called "slope control" for single phase welding. This control, when used with electronic control, which includes head adjustment by the phase shift method, permits the welding current to start from a relatively low value suitable for welding. Indications seem to show that the life of electrode tips is increased 500 to 1000 percent when welding aluminum alloys by using this slope control. Preliminary tests also indicate advantages in the use of such equipment for welding heavy-gage steel and for projection welding.



Typifying the move toward minimizing the size of welding equipment, this light-weight, engine-driven, d-c welder, designed for a wide range of applications, weighs only 660 lb. for a maximum of 250 amperes of welding current.

To reduce kva demand where power supply is limited, a three-phase resistance welding control was developed during the past year. This all-electronic, frequency-changer type of control features increased reliability and accuracy, and these advantages, together with the reduction in kva demand, indicate increased use of this type of equipment in the coming year.

Also of importance has been the development of a metallic rectifier capable of passing the thousands of amperes that are required for d-c resistance welding. This method of welding, like that of the frequency changer, also results in a lower kva demand, and the power is taken from a three-phase source.

With all of these developments there is one common point of great interest: the lengthened electrode tip life with improved results when welding some aluminum alloys. The important factor, as indicated by evidence gathered so far, is the rate of current rise which is inherently slow with three-phase equipment. With the frequency changer and the metallic rectifier systems, the time constant of the current rise depends upon the circuit constants and is not readily adjustable as may be required for the welding of different ma-

An aluminum casing being welded with an a-c inert-arc welder equipped with the "balanced wave" system for eliminating the continuous high frequency radio signal emitted by equipment formerly used for inert gas shielded arc welding. Engineer at left is checking on radio reception.

This small, Jeep-mounted welding generator makes almost any welding job easy to get to in a very short time. This innovation was one of the most interesting manifestations of last year's trend toward smaller, lighter welding equipment.

terials of different thicknesses. The slope control is capable of being adjusted to meet the requirements of these materials.

During the year ahead, it is evident that in most cases the single phase machine will continue to be the principal method of welding. However, it would appear that where power supply is a factor of determinable importance, the three-phase systems will find increased use. Also, the constant investigation going on to increase our knowledge of the effect of wave shape should point the way for many significant welding improvements in 1949.

In welding circles there can probably be no absolute agreement on the one most outstanding development in the field during the past year. In my opinion, however, it would appear that the great progress made in the welding of aluminum and light metals through the application of inert-arc welding was, at least, one of the most significant steps taken in the industry in 1948. The "baby brother" of the welding family, the inert-arc system has been gaining momentum at a terrific rate since it became commercially available some time around 1940. Last year research and development saw a considerable number of refinements in technique and improved designs of equipment for the inert-arc process.

Application data and specifications for the use of inert-arc welding is rapidly broadening the scope of this method. One of the characteristic advantages of this process is that it makes possible the welding of most metals without a flux, to aid in removing oxides, and to protect the molten weld metal. This gives the engineer and designer much greater latitude in design by virtue of the fact that subsequent flux removal is not necessary to prevent corrosive attack from this source. This characteristic has already proved valuable to the food, chemical processing, and other industries where contamination of the circulating media must be avoided. Particularly is this true on piping where the underside of the joint is inaccessible for welding or cleaning.

One great forward step in the perfecting of the inert-arc process in 1948 was the introduction, for a-c welding, of a new system for the elimination of annoying welder-caused radio interference. By using what is termed a "balanced wave" in conjunction with a built-in control, the continuous high frequency radio signal formerly used for inert gas shielded arc welding is eliminated, reducing the duration of welder-caused radio noise to a small fraction of a second. This is accomplished by balancing the current with a bank of series capacitors so that pure a-c flows between the electrode and the work. By thus stabilizing the arc without the use of radio frequency energy, filtering and shielding is made unnecessary. Preliminary tests also indicate that the balanced wave permits a cleaner, more easily controlled weld, and a saving in argon gas up to 25 percent can be realized.

The low initial investment in equipment for this process makes it attractive to the small user of welding. On applications where direct current may be used, the standard d-c welding generator is used with a minimum expenditure for electrode holder, cable, and gas regulator.

In the year ahead I look for even wider application of the inert-arc process, and with continued refinements and improvements I contend that it will play an increasingly greater part in the healthy growth of the welding industry in the future.

RWMA and AWS Announce Contest Prizes

Six prize awards totaling $2,250 for the best papers on designing for, application of, and research in resistance welding, submitted to the American Welding Society prior to August 1, 1949, have been announced by the Resistance Welder Manufacturers Association.

Top prize of $750 will be awarded for the best paper from an industrial source dealing with such topics as redesign of a product for lower cost manufacture by resistance welding; product improvement through use of resistance welding; resistance welding research; development of new procedures which broaden the usefulness of resistance welding.

Authors of the second and third best papers in this category will be awarded prizes of $500 and $250 respectively, the association stated.

The author of the best paper submitted by a university instructor, student or research fellow will receive a prize award of $300, with a $200 prize for the second best paper, from a university source, which in the opinion of the Board of Awards represent the greatest "original contributions to the advancement and use of resistance welding."

A new $250 prize for the best paper by an undergraduate student has been added this year for the first time.

Anyone in the United States and Canada is eligible to compete for these prizes, the contest judges for which will be appointed by the American Welding Society. "Industrial sources" include not only manufacturing but also consulting engineering and laboratory organizations.

Copies of the simple rules governing the awards are available from the Resistance Welder Manufacturers Association, 505 Arch Street, Philadelphia 6, Pennsylvania.

Finishing Review For 1948

By Edward Engel

CONSULTING ENGINEER, COLONIAL ALLOYS COMPANY

In polishing and buffing operations over the past year, a greater acceptance of sprayed polishing and buffing compounds occurred. These liquid compounds increase output and require less material than other forms. The dearth of skilled polishers caused a decided swing to automatic, semi-automatic and belt-polishing equipment, as well as intensive investigations of barrel-burnishing, centerless-grinding methods and embossed sheet.

The numerous patents issued for the electropolishing of metals is another indication of the economic urge. Automatic polishing and buffing seldom achieve the quality of work obtained from skillful manual operations. Electropolishing or chemical polishing following automatic buffing, however, provides a better surface than manual performances alone.

While there are many electropolishing production plants, there was no chemical-polishing (non-electrolytic) process, to our knowlege, in commercial operation here or abroad prior to the year 1947. In late 1947 the Colonial Alloys Company installed a full scale plant.

The Chemical Polishing process provides results on wrough aluminum alloys comparable with the electro-polishing methods. The initial investment is lower than that required by the latter approach, and production costs are less.

Vapor-blast honing received notable impetus in 1948 in an effort to circumvent labor scarcity and cost difficulties present in wheel-polishing.

Cleaning

More efficient chemical cleaning compounds were offered to commercial users than previously. Improved cleaning was gained by (1) improved balancing of the chemical salts for specific applications, (2) the correct choice of the wetting agent or agents, and (3) in the absence of soft-water, the inclusion of the proper water-softener or sequestrant. Emulsion degreasers gained new users in the past year.

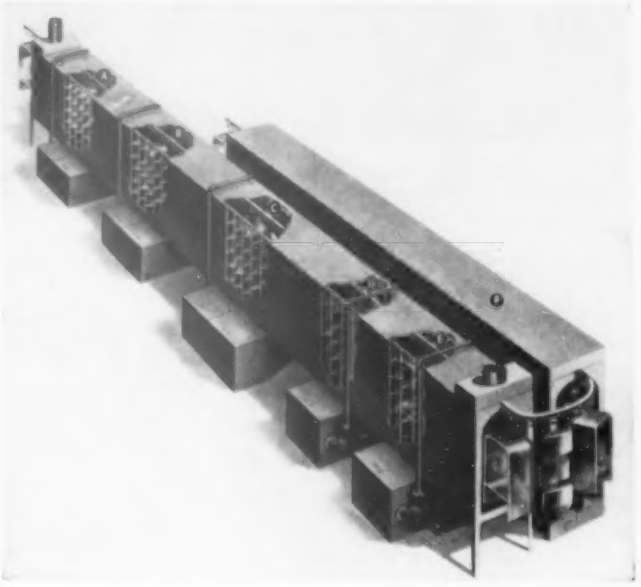
Plating

Periodic reverse current plating of silver, gold, copper, brass, nickel, cadmium, zinc and tin obtains reduced costs, greater strength, elasticity, density and less impurities. Several firms offer mechanical and electronic types of periodic reverse current units. G. W. Jernstedt of Westinghouse Electric Corporation should be given much of the credit for advancing periodic reverse current plating into the production line. Although the Dow process for plating on magnesium has not been placed in competitive commercial operation, a semi-plant unit installed last year was reported as indicating the practicability of the process for commercial finishing.

In essence, the preparation of magnesium alloys for subsequent plating, involves a few seconds dip in a solution at room temperature. An immersion deposit of zinc is obtained. Conventional plating sequences follow.

Hanson-Van Winkle & Munning installed their new bright cadmium plating bath in a competitive application.

The trade papers discussed several new baths for alloy plating, but no commercial results have been made available to this reviewer.



Shown above is a cutaway view of a typical Bonderizing installation for cleaning and finishing by the crystalline phosphate method. At A the parts are spray cleaned, then pass to B for rinsing. The coating is sprayed on at C, followed by a clear-water rinse at D. A Parcolene rinse is given at E, and the parts are dried in the oven at F.—Courtesy Parker Rustproof Co.

J. J. Lander & L. H. Germer of Bell Telephone Laboratories, in a paper "Plating Molybdenum, Tungsten and Chromium by Thermal Decomposition of their Carbonyls", state that various hardnesses can be obtained, and high carbon content coatings which are harder than sapphire. It may be that this type of adherent coatings on tool-steel will be of some value to the tool-engineer.

While on the subject of tools, it is claimed that electropolished and electro chromium plated high speed tools containing 4 to 9.5 percent of tungsten have a prolonged life of from 50 to 150 percent.

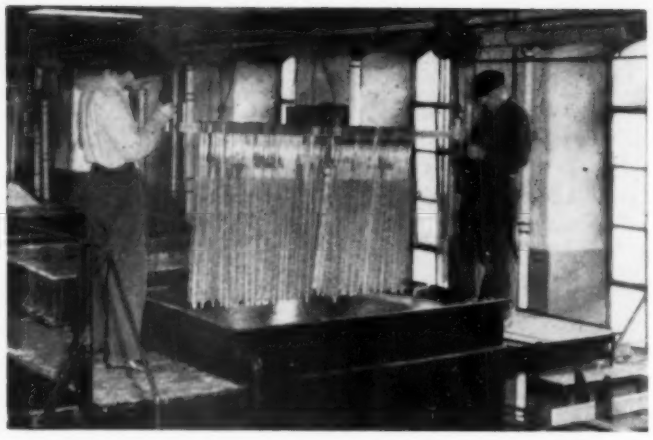
The Chemical Corporation and The United Chromium Corporation and others have installations for the brightening of zinc deposits. Some of the claims for these few-second dips are brilliance, corrosion superiority and lower costs of such treated zinc-plate as compared to barrel-plated nickel with a rack-plated chromium deposit.

A considerable increase in automatic plating and process equipment occurred in 1948. The Bullard Company broadened the scope of their well known (for automatic pickling) station type conveyor units. These units are now offered for all finishing processes.

Plating and anodizing tanks with diaphragms are by no means new. But B. H. McCahan and C. E. MacKinnon, E. I. DuPont deNemours & Company describe the use of a relatively impervious canvas diaphragm between the anode and cathode sections as a method for eliminating roughness of cyanide copper electrodeposits.

Aluminum Anodizing

Other than Alcoa's Alumiliting and Colonial's Electrodizing processes, no new type decorative anodizing installations were made in 1948, although, in effect, new end results were



Cleaning and chemical polishing operations are shown from front to rear tanks in this non-electrolytic installation.—Courtesy Colonial Alloys Co.

obtained in anodizing due to the previously discussed chemical polishing process. The latter dip treatment prior to anodizing achieves a reflective brilliant anodic finish in natural and dyed finishes, previously obtainable only at almost prohibitively high costs.

In further reference to decorative anodic finishes, Alcoa and Reynolds marketed, in 1948, various embossed designs on sheet stock. This type of stock may be drawn or formed, then chemically polished (without recourse to mechanical buffing), then followed by anodizing, to present a more luxurious effect than obtainable with plane surfaces. And, paradoxically the end cost is usually less than for the more drab finishes which result when plane surfaces are processed.

Surface Finish Testing Devices

A surface Reflectometer for evaluating polished surfaces was developed by E. A. Ollard. This device quickly presents comparative values on flat metal surfaces with a single reading. A plating thickness tester was evolved by H. T. Francis, Armour Research Foundation. Abner Brenner and E. Kellogg, National Bureau of Standards further developed Mr. Brenner's magnegage instrument to obtain the thickness of a composite nickel and copper coating on steel, non-destructively. The spiral Contractometer invented by A. Brenner and S. Senderoff, National Bureau of Standards, measures the stress of electrodeposits.

The Preparation of Metals for Painting

The adherence of paint on metals is definitely dependent on the cleaning and stabilization of the surfaces.

In spite of the numerous patents issued in recent years for the pre-paint treatment of steel and iron, Bonderizing (and similar phosphetizing processes) are almost universally used. Therefore there is little that is new to report from the industrial finishing viewpoint. However, the utilization of Bonderizing for the preparation of steel prior to drawing and cold extruding operations gained more commercial applications than all previous years combined.

Alcoa, American Chemical Paint Company and Colonial Alloys Company announced spray and dip processes which meet the new Army and Navy An-C-170 specifications for the preparation of aluminum prior to painting. For commercial applications where more competitive costs must be obtained two other pre-paint processes were offered as follows:

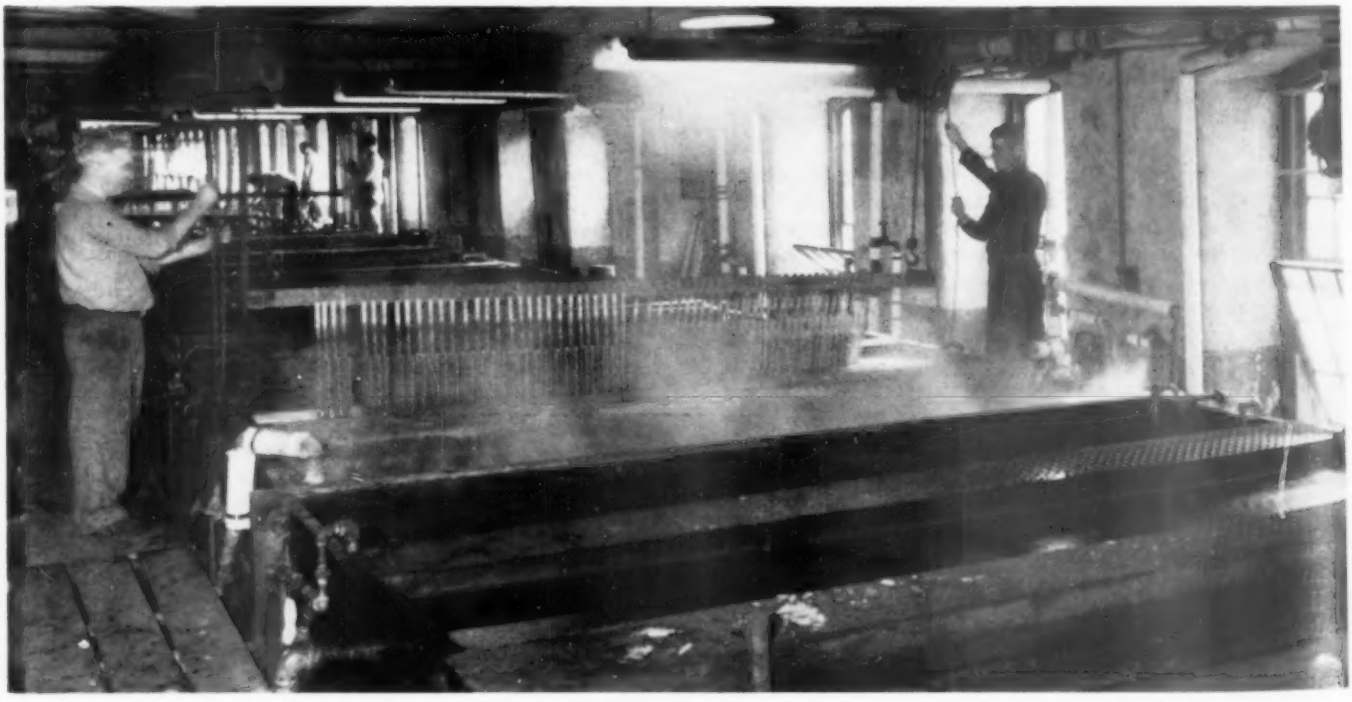
(1) "Paint Bond", which was reported to withstand 700 hours salt spray on 2S. Few seconds dip or spray at room temperature.

(2) "Anonizing", an immersion process which produces a colorless oxide coat similar to that obtained by a few minutes electrolytic oxidation (anodizing) treatment.

In addition to Iridite, Cronak and similar processes for the dip preparation of zinc die castings, a new process placed in commercial use in 1948 was a process developed by Colonial Alloys Company. This process requires but a half to one minute dip at room temperature in steel tanks. No chemical controls are required.

Painting

Strippable plastic coatings were increasingly used in pressing and forming operations, etc. Water dispersions of synethetic lacquers indicated satisfaction in a few commercial applications for dip coating. The one big draw-back of the above method is that only enough solution can be made up for daily consumption, otherwise waste occurs.



Here work in progress is illustrated, including cleaning, chemical polishing, anodizing and dye coloring operations.—Courtesy Colonial Alloys Co.

Developments in Forging Practice

By Waldemar Noujoks

GIRARD ASSOCIATES, CHAMBERSBURG - PENNSYLVANIA

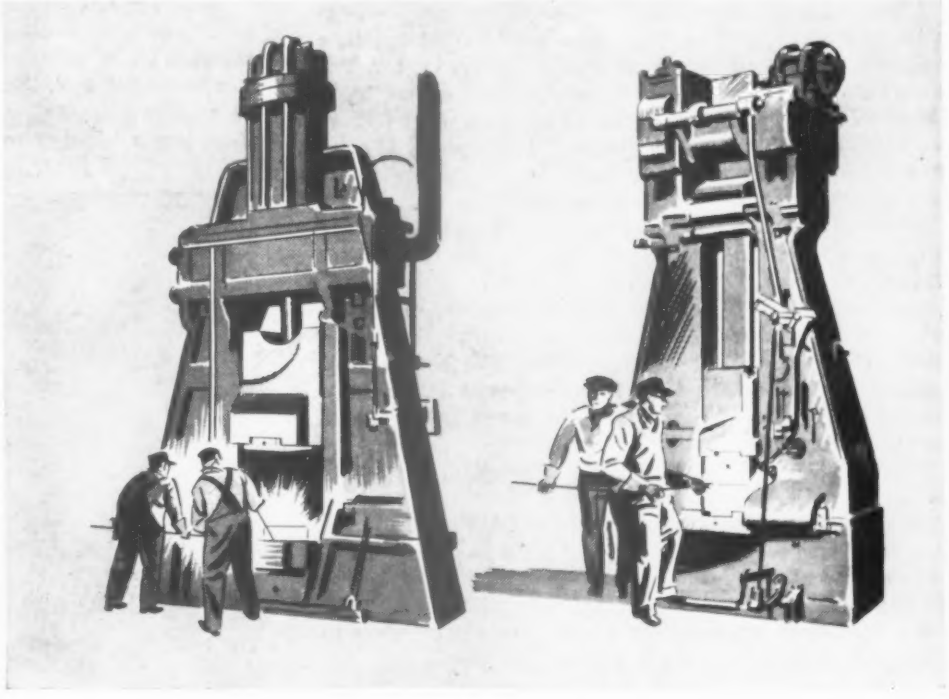
THE PAST YEAR has been an important one in forging practice, bringing out in the open the results of post-war developments. Forging practice, during the past three or four decades, has changed the finished forging from a relatively rough part that required a considerable amount of machining to fit it for use as a part of some machine, to the precisely shaped and intricately formed forging that requires a minimum amount of machine work, and is used often without any machining whatsoever. Heat treatment of forgings in those early days was not done, nor were the many alloy steels and non-ferrous alloys available. The trend towards exact shapes and closer tolerances was given tremendous acceleration during the recent war period. Forgings for war aircraft and other war equipment demanded exact and intricate shapes to close dimensional tolerances, first, to maintain unbroken flow lines for greater reserve strength, and second, to conserve machining capacity that was badly overtaxed.

The past year has seen many of the newer forging techniques being used to advantage on a wide variety of shapes and sizes for present day industrial and commercial applications. The high strength and low weight ratio in the forging has always been attractive to machinery and equipment builders. Closer commercial tolerances in a large variety of forged shapes has increased application possibilities. Present day shortages in ferrous forging materials has led to techniques still more improved, designed to reduce the amount of excess metal necessary to fill die impressions while retaining close forging tolerances and production output. The past year has marked a close and intensive search, by progressive forging plants, into every phase of forging practice for improvement in product and techniques at a more economical production cost.

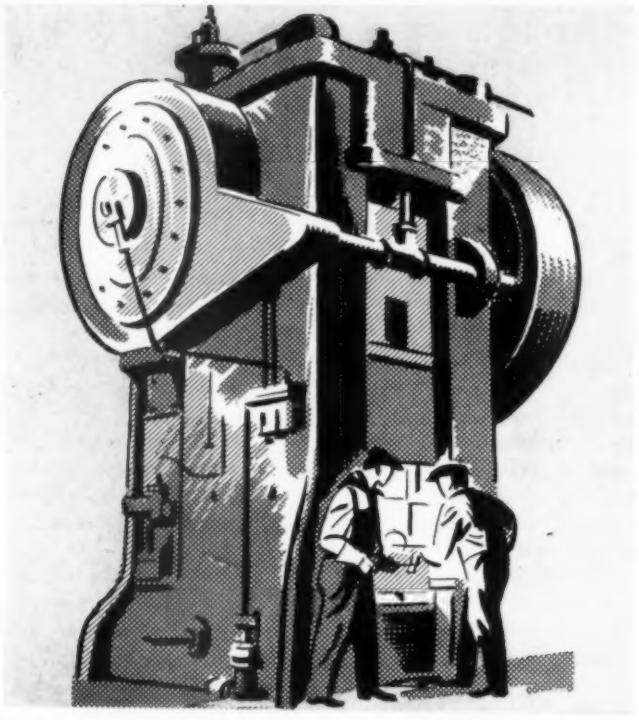
Basic new design features in the forging tools, such as the forging hammer, the drop hammer, the forging machine, and the forging press, have offered major improvements. Greater rigidity, increased strength, and machine tool precision in fitting of parts have resulted in equipment to permit close forging tolerances. Hammer design has considered carefully ease in operation, simplicity in adjustment, and convenience in proper hammer maintenance. Forging machines and forging presses have been designed for greater rigidity and precision to increase the range of forged products that can be made to advantage on these forging tools. Sizes have been increased with emphasis on higher production, longer operating life, and improved economy.

The problem of vibration as a destructive factor in forging plant economy has been analyzed. New and modern methods of vibration isolation have eliminated uncomfortable and damaging vibration from the forging plant and surrounding areas. The direct results of vibration isolation have been a decided decrease in worker fatigue to improve production, less damage to forging equipment to reduce maintenance costs, longer life on all shop equipment, to reduce operating and maintenance costs, and more satisfactory shop working conditions. Elimination of vibration by isolation is being given particular emphasis on large forging hammers, in sizes from 10,000 pounds and over.

Forge heating equipment, somewhat neglected in the improvement of other shop techniques, is being given considerable attention at the present time. The highly desirable mechanical and metallurgical properties available in many of the modern alloy compositions are dependent upon careful and precise forge heating conditions. To this end, it has been necessary to design and build forge heating furnaces that are capable of exactly correct furnace temperatures, suitable furnace atmospheres, and close temperature control, along with basic properties of long life and good economy. The new designs in oil fired and gas fired forge heating furnaces eliminate smoke and smudge by improved burner



With continued refinement in design, the steam hammer (left) and board hammer (right) have remained the basic tools of the drop forging industry.



Developments in forging presses have increased considerably the importance of this tool in the forging industry, and this trend towards increased use is expected to continue.

designs. Electric forge heating, particularly in the use of induction heating, has been making progress on forge heating applications where long production runs tend to justify the higher first cost. Induction forge heating is scale free. The newer types of oil and gas fired furnaces have reduced scale to a minimum, and for special applications, special atmospheres, such as lithium, are used to eliminate scaling completely.

Supplementary equipment and materials for use in tooling for production die forging has received attention with a view towards dies with longer forging life at lesser cost. Die block steels of better wearing properties and greater uniformity have been developed. Die sinking equipment and technique have been improved to make die impressions to very close tolerances, and newer finishing and polishing techniques offer smooth impressions with less sticking of the forging in the impression. Die lubricants, used in die impressions to prevent sticking, have been improved to eliminate caking in the dies and to reduce burning and smoking to almost nil. Summed up, this means that impression die forgings to closer tolerances, with smoother surface condition, and smaller draft angles are possible.

The importance of good basic forging design in development of shapes for maximum utility together with greatest ease in production, has been getting its rightful attention. The importance of proper positioning of forging flow lines, commonly called grain flow, is considered where a good ratio of strength to light weight is desired. Selection of suitable compositions are made on the basis of availability as well as of desirable mechanical and metallurgical properties so as to keep costs to a minimum.

Improved machining techniques on forged parts, particularly in jig and fixture design, has increased machining production. The newer fixture design recognizes that the natural increase in the size of the impression die forging, due to die wear, must allow for this growth so that the part always remains central about the basic axes. A greater portion of forgings are being heat treated before machining. Modern machine tools are capable of this tougher machining without decrease in machining production, and subsequent warpage due to heat treatment of machined parts is thus eliminated.

Developments are being made in the production of close toleranced forgings in the so-called super-alloys for gas turbine and jet engine service. These forgings have offered the most severe challenge to the production forging industry, and the challenge is being met. The result is that the aircraft industry continues to present parts of greater difficulty for the forging industry to produce. Such is the price of progress.

Parting Tool Design

By C. E. LeRow, Factory Service Division
Westinghouse Electric Corporation, East Pittsburgh, Pennsylvania

A parting tool design recently patented by the Westinghouse Electric Corporation has a number of advantages. The time required for cutting off material with this type of tool is considerably shorter than with conventional cut-off tools. Axle steel bars 5½ in. in diameter have been cut off in an engine lathe in 2¼ minutes. The same cut required 12 minutes with the ordinary cut-off tool. Bronze castings 5 in. in diameter were cut off in 39 seconds.

Designs have been developed for three sizes of tools. They range from 0 to 3 in., 0 to 6 in. and 0 to 8 in. of diameter of stock to be cut.

As illustrated in Fig. 1, the tool consists of a holder or yoke which provides top and bottom support for an inserted blade. The blade is held firmly by bolts. The blade can be removed easily for sharpening and then re-set without disturbing the holder. This eliminates the necessity of re-aligning the tool each time it is sharpened.

It is often the custom to reverse the direction of rotation for cutting off large diameter materials. The cut-off tools are often mounted on the rear position of cross slides. In either case, to reverse the tool merely requires the loosening of two bolts in the holder, reversing the blade, and re-tightening the bolts.

For operations requiring the tool to be brought close to the chuck, the holder is made with a bent shank.

The blades can be tipped with tungsten carbide, cast alloy or high speed steel.

While the first cost of this type of tool is almost identical with that of equivalent sizes of solid forged tools, the replacement cost of blades is about five percent of the cost of a new forged tool. The holder will last indefinitely with reasonable care. Owing to the rigidity of the tool, the blades have longer life despite higher cutting speeds.

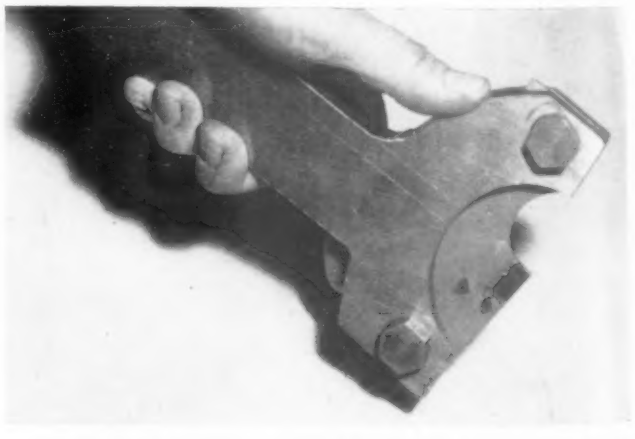


Fig. 1—Parting tool recently patented by C. E. LeRow, Factory Service Division, Westinghouse Electric Corporation.

Inspection Moves Ahead

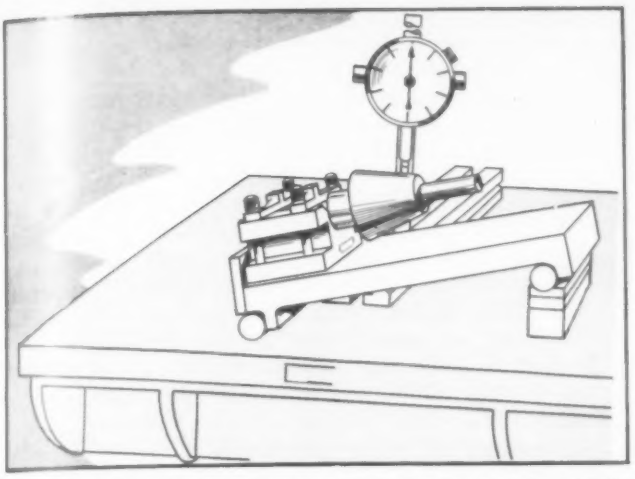
By William A. Ormondroyd

THE TAFT-PEIRCE MFG. CO.

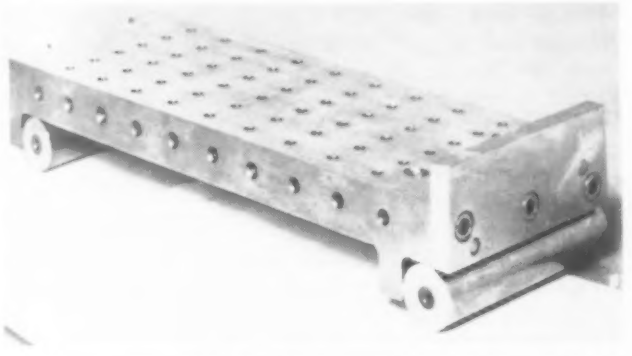
BUT A RELATIVELY short time ago, the master tools of the average inspection department were the micrometer, the height gage, the vernier and the depth gage, supplemented with snap gages and ring gages.

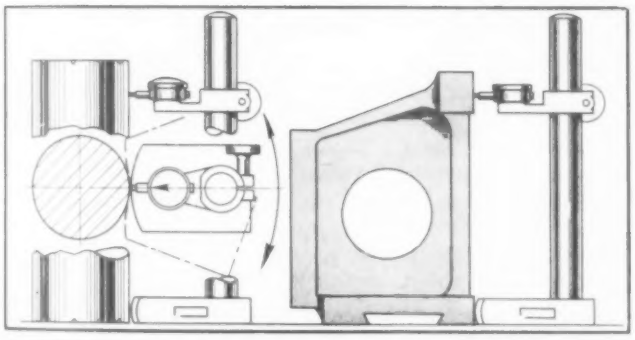
If, in that era, an inspection department fortunately possessed a set of size blocks—or gage blocks, as they were sometimes called—it usually kept them under lock and key. For the most part, gage blocks were used as master reference gages to settle arguments over the difference in "feel" of two or more users of the same measuring instruments, or because the instruments themselves were not always adjusted alike.

Indeed, most measuring instruments of the day involved the human element of "feel" and, as the need for closer tolerances grew out of the ever increasing precision demanded by the rapidly expanding machine age, arguments due to difference in "feel" became more frequent and troublesome.



A line drawing, showing the sine block set up to gage a tapered roll. The block is set up to one-half of the desired taper, and a dial indicator gage moved along the top surface will show either correctness or any variation from the desired norm. Below, a sine bar block, such as shown set up in view above.





A development of 1948 is the comparator square, by Taft-Peirce Manufacturing Company. This modern version of the precision square incorporates a dial indicator, graduated in tenths of thousands, which is mounted on a vertical stand having a radius at the front of the base. By placing this stand on a surface plate and against a cylindrical master square, an accurate reading is obtained on the dial indicator, as shown in the view at left. The reading established, the square may then be used with a workpiece to determine squareness or error of the work.

At left, the "Comp-air-ator", an air gage by Taft-Peirce Manufacturing Company, Woonsocket, R.I. A double-bank unit is shown, for both internal and external checking; however, the gage can also be had in single and multiple bank. Air gages, developed by several leading gage manufacturers, came into widespread use during the past year.

Above, a power driven thread gage, a '48 development by Taft-Peirce Manufacturing Company. This gage is not designed to increase accuracy in inspection except as it relieves monotony and fatigue resulting from repetitive handling and thereby enhances operator alertness. The power drive also increases output and further adapts it to the production line. All illustrations, this page, by courtesy of Taft-Peirce Mfg. Co. Woonsocket, R. I.

During this period of development, manufacturers began improvements toward more positive measuring instruments. The so called super-micrometer and several different types of mechanical measuring machines were invented, for the most part using the same method of calibrations as the earlier ones but carried to a much closer degree of measurement. This materially reduced the incidence of errors due to the personal equation.

These later machines were a big step forward and their initial success brought about such measuring devices as the mechanical comparator, the electric measuring machine, light measuring machines and many others began to make their appearance. All of these contributed towards the elimination of "feel".

It is probable that designers have made the greatest progress in our mass production industries. In the automotive industry, for example, where identical parts are made in repetitive production for months and sometimes for years, inspection machines have been designed and built which are fully automatic. On such machines, the human element has largely been eliminated.

The Ford Motor Company has issued a sound motion picture entitled "Research at River Rouge", in which a number of such automatic machines are shown in operation and demonstrated. Since it illustrates quality control at its best, it is recommended that every designer or tool engineer who is interested in quality control should see this film. This does not mean that special inspection machines invariably should be designed and built where large quantities of parts are being manufactured. There are universal inspection machines on the market which can be set up to inspect, sort, and count parts automatically even where several different dimensions are involved. Some of these machines are conveyor fed and can be adapted to a variety of work.

While the sine block—of major importance to any inspector in measuring angles and tapers—is not a new tool in industry, it warrants mention due to its many and varied uses. It is manufactured in several different models which broaden its uses, some of which are shown in the illustrations.

Inspectors may recall the difficulties encountered in testing tapers on round shafts with the use of taper ring gages. These gages were useful and effective only as long as the taper was correct and the gage fitted. Where errors occurred in the taper, however, there was considerable difficulty in determining the degree of error. With the aid of the sine block, such error can be quickly determined, as suggested in the accompanying illustrations. There are hundreds of ways in which this block and various other models can be used to check angles accurately.

The air gage came into widespread use during the year 1948. Compact and of portable design, making it handy in the inspection room, this gage eliminates entirely the operative skill and the element of human "feel". A 2500 to 1 amplification is obtained with 0.002 in. as a scale range. Gages of this type may be equipped with air plugs, air ring gages, adjustable air snap gages and master setting gages. They may also be supplemented with horizontal or vertical gaging stands, thickness gage stand, gage handles with flexible air hose, and combination ID and OD fixtures.

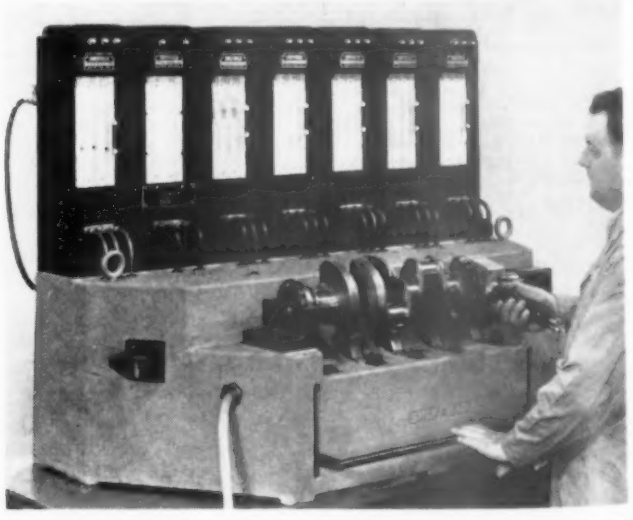
It may be noted that, through the use of extension air hoses, the gage can be used as measuring equipment on the production line. Both pressure control and zero settings are easily accessible to the operator since they are located on the gage housing. This air gage can also be had in two or more banks for inspecting several dimensions simultaneously.

The comparator-square—another development of 1948—is equipped with a very sensitive dial indicator which measures in divisions of 0.0001 in. This gage, which mounts a dial indicator on a vertical stand provided with a radius at the front of the base, is useful in checking the squareness of work. By placing the gage on a surface plate and setting against a cylindrical square, an accurate reading is then applied to the workpiece instead of the cylindrical square, thereby determining the squareness or the amount of error in the work, if out of square. Application is further explained in the accompanying sketches.

The power-driven thread gage—also a 1948 development—was not designed to increase accuracy in inspection but rather as a time saver in the inspection of large quantities of threaded pieces. Use of the power gage will cut inspection costs considerably, and will further relieve the monotonous and endlessly tedious task of screwing a plug gage successively into several thousand threaded pieces. This gage is equipped with a slip clutch mechanism which releases and reverses the moment a slight resistance is encountered. By using an extended flexible shaft, this gage may be used on the production line.

There are many and varied types of gages besides those mentioned, but in the final analysis they all are aimed at the one objective—to eliminate the human "feel" in inspection operations. Some of the gages in use actually signal the operator if the part is acceptable, undersize, or oversize.

Typical of modern inspection equipment is the multiple stage piston gage. This gage, by Pratt & Whitney, has been developed to facilitate assembly of automotive pistons and checks six dimensions simultaneously, stamps two grades and automatically shows the number of pistons in each grade inspected. The gage incorporates Pratt & Whitney Electrolimit and multiple electric contact mediums. Photo by courtesy of Pratt & Whitney, Division of Niles-Bement-Pond Company, West Hartford, Connecticut.



Also among ultra-modern gages is the crankshaft checking Precisionaire, by The Sheffield Corporation, Dayton, Ohio. This machine is designed to accurately check automotive crankshafts for size and out-of-round. The main bearings are checked simultaneously with Sheffield airsnaps, each having three sets of jets which provide gaging midway between and 1/8 in. from each adjacent flange. At the same time, two other Precisionaire jets check the seal diameter and the width of the rear bearing.

By [illegible] W. Lengbridge

Supplementary Press Forming Operations

Installment No. II of a Series on the Theory and Practice of Pressing Aluminum

WHILE THE SHAPING of hollow vessels by pressing is usually done by means of drawing operations, supplementary operations—such as expanding, contracting, flanging, and beading—may be necessary in some cases in order to complete the forming of the shell. On some shells, a portion of the side-wall metal must be expanded to a larger diameter; others may require a portion of the wall reduced in diameter.

A flat flange, or a curled or beaded flange, may be required around an opening in or at the top of the shell. This type of forming can be done in presses, and most of the supplementary operations can also be done on oval or circular shells by means of spinning or rolling operations on a lathe. The choice of method depends on the nature of the work being done, the amount of metal movement involved, and the cost of tooling.

Substantial expansions may be obtained by means of rubber or liquid expanding media in press tools. Certain circular shells may be expanded by rolling operations. Shallow grooves may be rolled in or out with simple tools on lathes. Inversely, substantial reductions in diameter may be done in one operation by spinning on sectional chucks or on internal rolls, or by means of a series of necking operations on press tools. Flanging the edge of a hole can often be combined with cutting of the opening, providing the height of the flange is not too great.

On non-circular work, curled beads may be formed on press tools or on cam beading equipment. On circular work, it is usually more economical to form the bead on lathe tools; however, the high speed of pressing operation often effects a saving in labor when the quantities required are large enough

These articles are a collaboration between the author, Mr. Lengbridge, and Aluminum Laboratories, Ltd., of Kingston, Ontario.

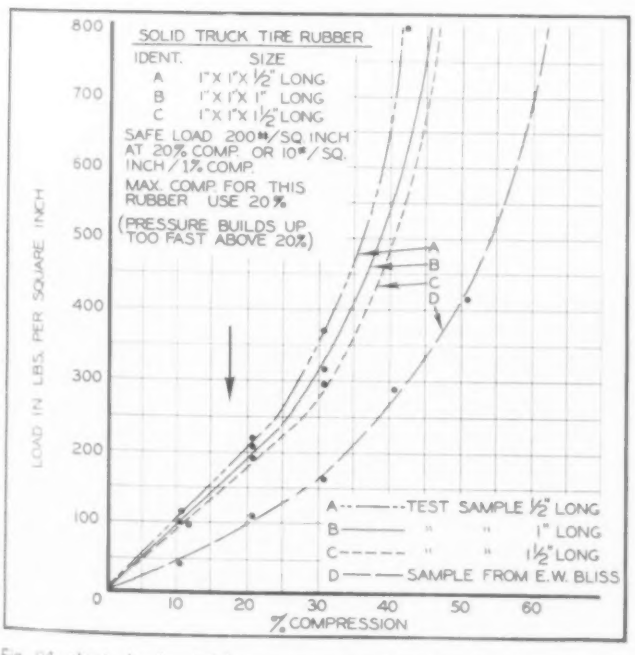


Fig. 94, chart showing holding pressure of rubber in press tools, together with a comparative curve taken from a report by the E. W. Bliss Company, manufacturer of press equipment. The rubber used in the test was 1 in. square in area and had a strength of 200 psi at 20 percent compression. However, the amount of compression should not exceed about 20 percent; above that, the rubber becomes too solid.

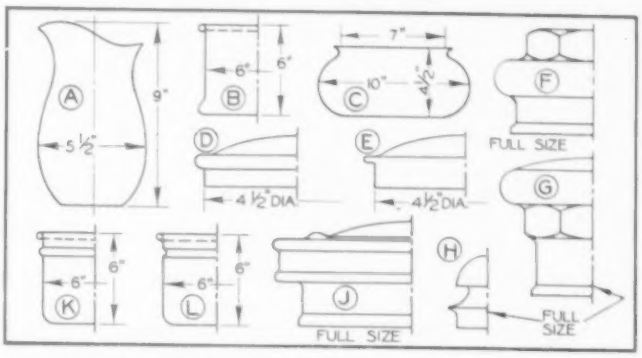


Fig. 93, showing typical shells which can be expanded to shape. The shells A, B, C, D, F and G may be expanded in press tools by means of rubber expanding pads. The shell E can be expanded without any expanding media. Shells A, B, C and D may also be spun or rolled to obtain the bulged or expanded shape. The dome of the shell at H is a particularly severe example of expanding, but can be successfully done using rubber as the expanding medium. Shell J is a sharp cornered shape which requires the use of water in order to force the metal out. The shallow grooves in shells K and L are most economically done by rolling.

to absorb the higher cost of press beading tools. Lathe operations mentioned come under the heading of Spinning and will not be elaborated on in this paper although, being part of press-forming processes, a few of these supplementary operations will be described here.

In this group of operations the plastic movement of the metal may involve tensile stresses, compressive stresses, or both, depending on the work being done. Because the metal has already been cold worked and hardened by the drawing operations, several expanding or contracting operations may be necessary in order to completely reshape the work-hardened material to the contour desired.

Expanding and Expanding Media

A few typical shells which can be expanded to shape are shown in Fig. 93, and in order to indicate the amount of expanding involved, these shells are drawn to relative scale. If the change in shape is considered in terms of the percent change in diameter, the severity of the work done in the expanding operation will be evident.

As in other pressing operations, the limitations on expanding, is the amount of cold working which the metal will stand before it fractures. An increase in diameter or circumference of approximately 30 percent in one operation is about the maximum for ductile metals. Large increases in diameter may necessitate two or more operations with anneals between, particularly if the metal has been severely cold worked during the drawing operations.

The method to use for any expanding operation depends on the shape and thickness of the shell and the temper of the metal. Some shapes may be expanded by several methods; others are limited to one. Some may be done only on dies, some only on lathes, and some, of course, by both methods.

While certain contours may be expanded in dies without an expanding medium, it is necessary, in some cases, to provide some means of controlling the direction of the metal movement. The medium may be in the form of expanding segments, rubber pads, oil or water. Segment dies are limited to certain shapes, but are fairly satisfactory when the metal is thick. When used for thin metal, the segment joints tend

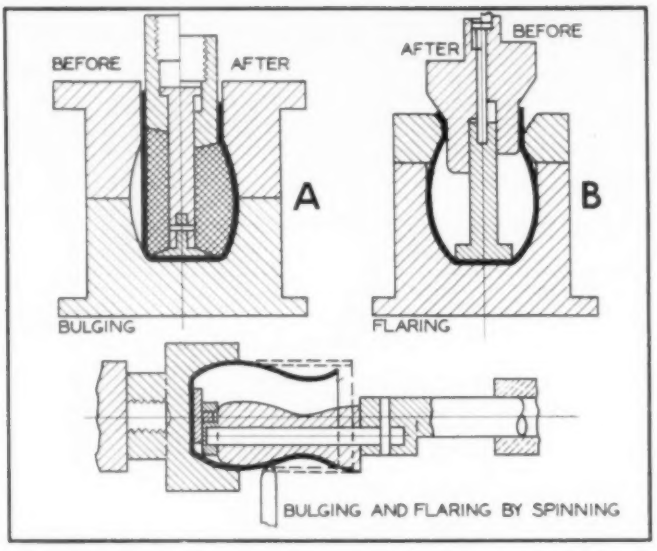
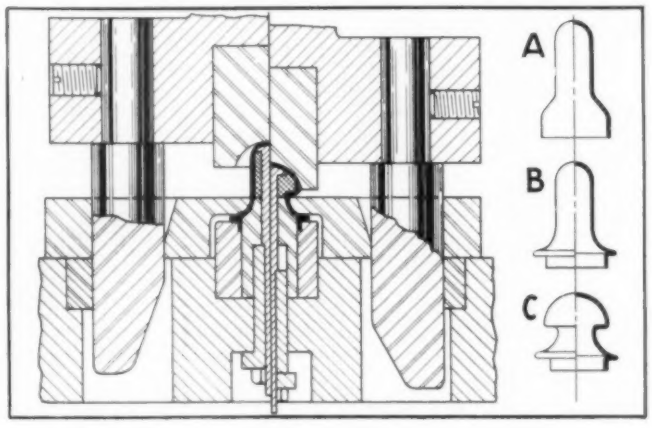


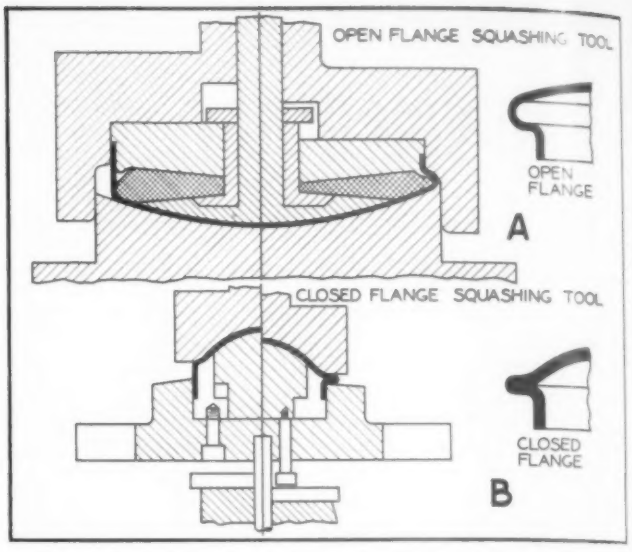
Fig. 95, upper left. The methods for expanding the water jug shown in the three views coincides with A, Fig. 93. 95A shows a double-action press bulging tool, in which the shell is expanded with a rubber pad attached to the punch. The upper half of the cavity is machined in the blankholder, and the lower half in the die. When these two parts come together at the beginning of the operation, they provide the necessary cavity. In operation, the punch moves down into the shell, and its bottom face comes in contact with the bottom of the die cavity. Further downward movement compresses the rubber causing it to expand and force the metal into the closed cavity. When the punch moves up, the rubber pad assumes its original shape and permits the removal of the shell. The top of the jug can then be flared in a single-action press operation as shown at B. The top ring of the flaring die would have to be split so as to support the metal being flared and also to permit the entrance and removal of the shell. The jug may further be expanded and shaped by spinning in a lathe, as suggested by C, Fig. 95.

Fig. 96, upper right, showing expanding of cover shapes. In the example at A—an open flange squashing tool—the cover may be expanded with a soft, spongy type of rubber. The rubber disc should be chamfered at the edges to as to localize the expanding forces, and the faces of the pressure pads should be tapered toward the center for the same reason. The cavity is formed when the punch and die come together. The sleeve on the center pin holds the rubber in position and allows the knockout plate to strip the cover from the rubber disc when the punch moves up. The view on the left of the center line shows the condition at the start of the stroke, and the view at right shows the completion of the stroke. Closed flanges may be expanded without use of an expanding medium, as suggested by the closed flange squashing tool at B, Fig. 96. The operation is based on controlling the failure of a band of skirt metal, which is

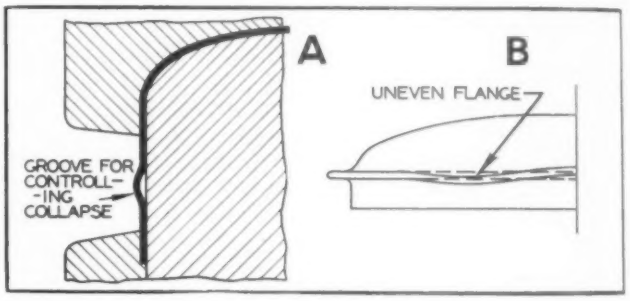
to mark the shell, and leave flats at the gaps between the segments. While expensive, this type of die is fast in production and quite effective on tough metals.

Rubber is a common expanding medium and, when used under the proper conditions, quite efficient. The grade of rubber to use for any job depends on the work to be done. Some operations demand a comparatively soft spongy type of rubber, while others may require a hard grade similar to that used in solid truck tires. The rubber is usually in the form of a plug or pad, and is sometimes attached to the punch and sometimes to the die. In all cases, it must be located and shaped so that it will apply pressure on the shell wall at the proper point.





made to collapse outward and then flattened. In this type of expanding tool, the metal in the upper part of the cover and the lower part of the skirt it more or less confined. The center pad is free to move outward, and when the pressure is applied the band begins to collapse. To make a uniform flange, the collapse should take place along a plane parallel to the bottom edge of the shell and in about the center of the band. The width of the flange obtained depends on the width of the band which is free to collapse. Within certain limitations, the collapsing will take place at the center of the band. When, however, wide flanges are required necessitating a wide collapsing band, it is usually better to roll or form a groove in the skirt so as to make the metal collapse at the right place. If the width of this band is too great, the metal will not collapse uniformly along this plane without a preformed groove, but above it in one place and below it in another, resulting in an irregular expansion and a wavy flange as shown in Fig. 97, below.

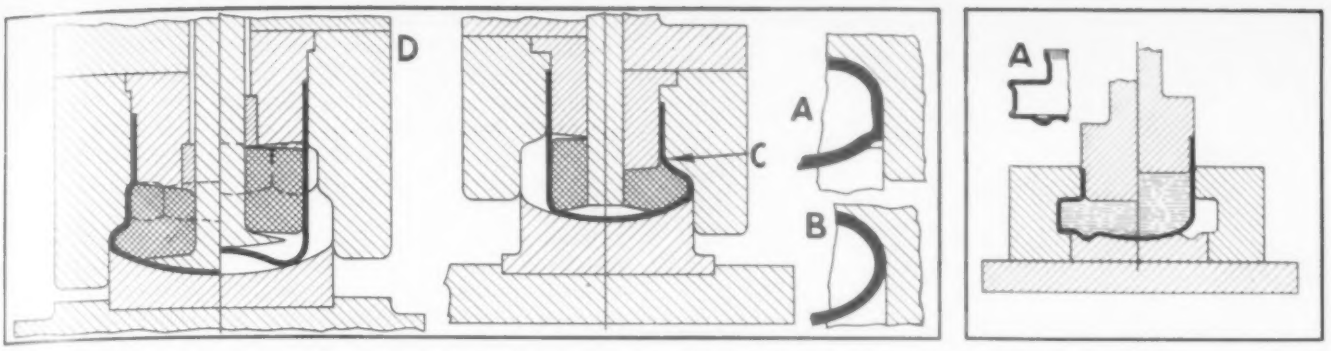


Whenever rubber is used as an expanding medium, two important precautions must be observed: (1) The rubber must be kept free from all contact with oil, because the oil attacks the rubber and so reduces its bulk that a full expansion cannot be made. (2) The rubber and the shell must be lubricated with talcum powder, powdered pumice stone, or some similar powder lubricant, in order to reduce friction which, causing heat, burns the rubber and alters its expanding properties. Tests, made on hard rubber for severe expanding operations—Fig. 94—show that a grade or rubber with a strength of about 10 psi for each 1 percent of compression is most satisfactory.

Water is another good expanding medium and, while rather messy in operation, is capable of surprising results. In some cases, the work is done by applying pressure on the water with the face of the punch. In other cases, small expansions can be made by the displacement of water occurring when part of the punch enters the water.

In hydraulic dies, the water pressure is applied through valves from an accumulator although, with most dies in which water is used, the working pressure is applied directly by the punch ram. When this type of die is used, the most

Fig. 98, showing the tools for the cover knob illustrated at H, Fig. 93. A, B and C show stages before squashing, before bulging and after bulging, respectively. The lower skirt of shell—A—was first expanded without an expanding medium to form the flange shown at B. The die used was similar to the one shown at B, Fig. 96. The top of the shell was then expanded in a split die shown at D, Fig. 98, to form the dome. Rubber was used as the expanding medium.



Figs. 99 and 100, left and right, show operations for the hub caps F, G and J, Fig. 93. The rubber expanding tool for the cap at extreme left was about 1 in. thick and, under proper working conditions, would expand about 200 shells before replacement was necessary. For parts of this type, the radius at C should be made as liberal as possible and the compressing pads tapered about 10 deg. The top edge of the lower form should be as sharp as possible, to avoid crevices into which the rubber might force the metal. The "wrong" way is shown at A, while the correct condition, at B, illustrates how the lower form supports the bulged radius when correctly made. The metal was 0.045 in. thick aluminum. In production—which averaged about 700 per hour—each shell was powdered inside with talcum. The rubber was powdered after each fifth shell, particularly in between the pressure faces where most of the friction occurred. The die for cap G, Fig. 93, is shown at right, Fig. 99. This cap required a hexagon shape under the head, to be formed by rubber. The double step, and the hex with its sharp corners, involved considerable metal movement. As finally worked out, the shell was produced with a concave bottom, this supplying the metal needed for full expansion. Fig. 100, at right, shows the tool for expanding the cap J, Fig. 93. This part, which presented a severe case of expanding because of the sharp corners, was produced in the split die shown, using a measured amount of water as the expanding medium. The punch was made a close fit to the inside of the cap, to obtain seal. A flange or step on the punch assisted the movement of the metal by pushing on the skirt as the water forced the metal into the cavity. The die was opened and closed by a lever.

important precaution is to carefully measure the amount of water placed in the shell. With too much water, there is a danger of bursting the die; with insufficient water, the expanding may not be fully formed.

Oil and tallow are sometimes used for expanding operations, the oil being used in the same manner described for water. Tallow, which is poured into a shell and melted out after bulging, is positive but slow in operation; however, it is particularly useful for expanding thick steel shells.

Die Cavities: Typical Examples

The dies must be designed so that they provide a closed cavity into which the expanding medium can move the metal. The joints on split dies must be well matched so that there are no crevices into which the metal can be forced, thus forming ridges on the finished part. The cavity may be entirely in the die, as in the case of split dies, or the cavity may be made by bringing together the lower part of the punch and the upper part of the die. Split dies may be opened and closed by means of cams or levers.

A description of a few typical expanding operations will serve to bring out the important points, and sketches of some of the tools used will illustrate the general arrangement of the operation. The drawing operations for producing the shells to a shape ready for expanding need not be discussed here since that type of operation has already been described in a previous section.

The water jug illustrated at A, Fig. 93, can be expanded with rubber in a tool similar to that shown at A, Fig. 95, or flared in a single-action press as shown at B. It can also be formed by spinning on a lathe, as shown at C, Fig. 95, and although this method appears much simpler than the press method, it is also much slower in production. If the quantities required are large enough to warrant the higher cost of press tools, the press method is more economical and does not require such highly skilled operators. Shells B and C, Fig. 93, can also be expanded in dies similar to the one suggested for the jug, and the contours may also be rolled or spun in a lathe if the cross section of the shell is circular.

Flat cover shapes may be expanded in dies such as shown at A, Fig. 96, while closed flanges may be expanded without the use of an expanding medium, on a tool similar to that at B, Fig. 96—that is, providing the flange width is small in proportion to the cover diameter. The operation is based on controlling the failure of a band of skirt metal, which is made to collapse outward and then flattened.

At A, Fig. 97, is shown a section of an expanding tool and a typical groove rolled on the skirt of the cover, and Fig. 97B shows the result of expanding too wide a band without first grooving. Flanges up to $^5/_8$ in. wide have been obtained on large washing machine covers by this method after prerolling a groove on the skirt. The operation is similar to making a compression test on tubing, and the pressure required will be nearly the compressive strength of the tube, or as per formula:

$$P = 11\ (d_1^2 - d_2^2)\ S/4$$

In which d_1 = outside diameter; d_2 = inside diameter; and S = compressive strength of the metal in psi.

The cover knob shown at H, Fig. 93, is an interesting example of expanding, taken from actual shop records. The steps are shown at A, B and C, Fig. 98. A comparison of the neck and expanded diameters of this knob will indicate the severity of the doming operation. The rubber plugs used were 17/32 in. in diameter by $^1/_2$ in. long, and were required to expand the top of the shell to a diameter of $^7/_8$ in. Several kinds of rubber were used, and the most satisfactory were plugs made from truck-tire rubber.

The main problem of the operation was short rubber life, caused by oil left on the inside of the shell from the previous drawing operation. The corners of the plugs would burn and disintegrate, and the domes would either split because of internal friction, or collapse because the rubber had crumbled to a size which was insufficient to support the metal. By thoroughly removing all oil from the shell and tools and lubricating with powder, rubber life was increased from 50 compressions to about 800 before replacement was necessary.

The early designs of automobile hub caps presented some interesting problems in expanding, and while this type is now obsolete, the shapes nevertheless apply to many current press-forming operations. Many of these parts were ex-

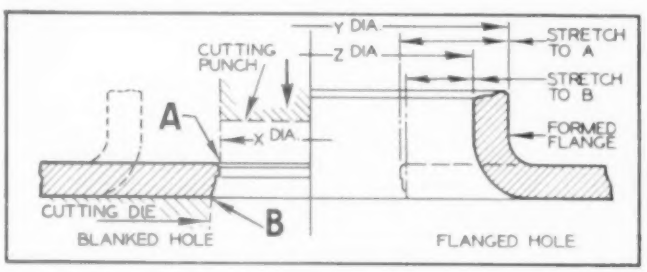


Fig. 101, showing flaring of edge of an opening. Because the bottom edge is more likely to split than the top edge when being stretched, the cutting of the hole should be done from that side of the metal on which the flange will later be formed. Corner A is smoother than corner B because the cutting punch entered the metal from the top face. In flanging, corner A is stretched to diameters x to y. Corner B is stretched a lesser amount, or from diameter x to z; thus, the smooth edge—being at the point of greatest stretch—minimizes the danger of splitting.

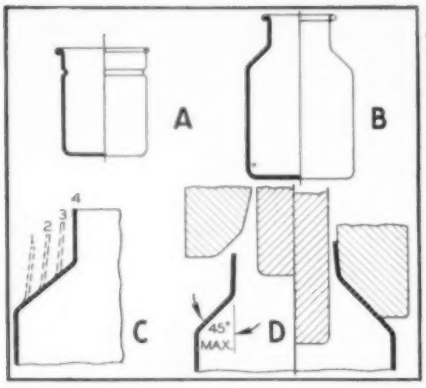


Fig. 102, showing necking operations. A comparatively shallow groove is shown at A, while D shows the tool for the severe contracting of the bottle-shaped shell at B. The stages of reduction are indicated at C. The act of necking on a shell increases the initial thickness and height of any unit ring of the metal being worked and this must be allowed for in the tool design. The angle from the body to the necked diameter should not exceed 45 deg because of danger of collapsing the shell.

panded with rubber, and some of the more difficult ones were expanded with water as the medium. The design of some caps made it necessary to use split dies to make the cavity whereas, for others, the cavity was made by the mating of the punch and the die. The two dies in Fig. 99 illustrate the general design of this type of expanding tool.

The hub cap shown at G, Fig. 93, required a hexagon shape under the head of the cap, to be formed by the rubber. The double step of the head, and the hexagon, together with the sharp corners at its points, involved a lot of metal movement. The first shells tried in this die were convex on the end, and the scrap in the expanding operation was high because the shells split before they were fully expanded. This seemed to indicate that there was not sufficient metal to fill out the shape. The final draw tool was then altered so as to provide a concave bottom. This supplied the extra amount of metal needed to make a full expansion, and reduced the scrap caused by splitting. The general design of this tool is shown at D.

The hub cap shown at J, Fig. 93, presents a severe case of expanding because of the sharp corners. It was produced on a split die illustrated in Fig. 100. This type of tool is slower in operation than dies using rubber, but does not give much trouble if care is used in correctly measuring the amount of water. Two operators are usually required, one to fill the cups and one to operate the press. After expanding, the wall is grooved by rolling to improve the design as shown at A.

Because it involves the expanding or stretching of edge metal, another group of operations which should be considered here is the flanging group. While a considerably simpler type of operation than that involving expanding of body metal, the tendency to fracture is greater because every nick or roughness is a potential split when the metal is stretched. Sometimes referred to as Burring—a rather misleading term—this group is better described as Flanging and includes such operations as turning up or down the cut edge of holes in sheet metal. See Fig. 101.

It may be recalled, in the discussion on shearing, that the top edge of a blanked hole is radiused, and the bottom edge is sharp or burred. In shearing, the punch entering the metal tends to round over the top edge and leave a burr at the bottom edge. Because of this, the bottom edge is more likely to split than the top edge when being stretched.

In some cases, it may be necessary to round off the top corner before flanging, or—if the flange is to be high—to do the work in two operations. The limitations on the height of flange, possible in one operation, is the amount of stretching the metal will stand without cracking. In general, this capacity is indicated by its elongation in the tensile test. With reasonably ductile metal, and a comparatively smooth edge, the increase in diameter may be as much as 30 percent.

The foregoing operations concern expanding or increasing the diameter of a shell at some part of the wall. Contracting or necking operations are those which reduce the wall diameter; that is, cause a movement of metal in the opposite direction to expanding. This reduction may range from a shallow grove, as shown at L, Fig. 93, to the severe contracting of a bottle-shaped shell illustrated in Fig. 102, B.

As in expanding, some necking operations may be performed by spinning or rolling. In some cases, the same effect can be obtained by expanding from the neck diameter to the body diameter, providing the area of metal moved is not too great. Sometimes, rotary swaging is used for heavy metal shells and tubes.

Reducing the tops of seamless metal bottles is closely related to single-action drawing except that, in necking, the metal is stressed entirely in compression instead of partly in compression and partly in tension. The reduction in diameter per operation should not exceed 8 percent for hard metals, and about 15 percent for soft, ductile metals. Frequent annealing may be necessary to prevent cracking.

Curling and Beading

The last group of forming operations to be discussed in this installment is the beading group. Beading is sometimes referred to as "wiring" when the metal is curled over a supporting wire, and "false wiring" when the bead is unsupported. Like flanging, the work is done on the edge metal in a press, lathe, or cam-beading machine.

In beading operations performed in dies, the following factors are important: (1) the curling grooves should be true to shape and size, and be finished with a high polish; (2) the work should be securely and accurately held so that the groove and the edge come together properly; (3) the starting corner of the edge should be either rounded or slightly flared. The latter assists the metal movement around the curling groove.

On circular work, beads are usually rolled in a lathe or a beading machine for reasons of tooling economy. Lathe production on this operation is quite fast and the tool cost is fairly low. Consequently, press beading is usually confined to irregular shapes or production runs which are large enough to absorb the high cost of press-beading tools. Even on square, rectangular and oval shapes, cam-operated beading machines are often preferred to dies, because of production possibilities on this type of machine and the lower cost of tools. A typical beading die is shown in Fig. 103.

Installment No. 12 will follow in April issue. THE TOOL ENGINEER.

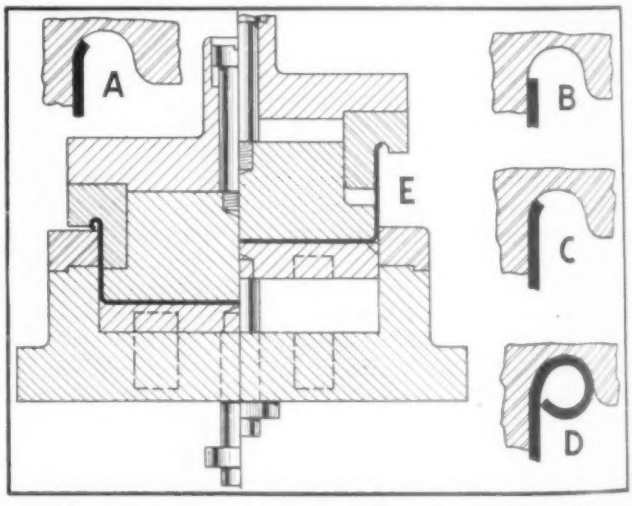


Fig. 103, showing a typical beading operation, with correct and incorrect edge conditions. A shows effect of trying to curl a bead when the edge which makes contact is sharp. The leading edge bites into the groove instead of flowing around it, and tends to bend away at the start and collapse as the punch moves down. B shows the rounded edge in contact with starting wall of the groove—a considerably better condition. However, the best beading condition is shown at C, in which the edge has been slightly flared. This gives the metal an easy start around the groove. This flaring effect can sometimes be obtained by tapering the punch slightly up to the point where the radius begins, as shown at D. The inside radius of the bead should be from 1½ to 4 times the metal thickness.

34-91000

A Resume' on Metal Cutting

By A. E. Rylander

Installment No. 9 of a Series

WE WILL RESUME discussion on the part used for case study, February issue and, in order to give students a broader insight into methods, we will deviate somewhat from the sequence of operations previously outlined. However, readers who are following the series should refer to the part drawing, preceding installment, although the part will be shown in place in the tools to be discussed here.

Since the two castings that make up the composite part must be assembled for further practical processing, their mating faces must necessarily be machined as a prior operation. There are various ways to do this. They may be ground on a production grinder; may be set in a fixture and both parts faced simultaneously on an engine or turret lathe; they may be faced singly or in pairs on a shaper or ganged on a planer; or, they may be faced on a milling machine. The choice would largely depend on the type of machine equipment available.

However, we will choose the miller, and here we can use either a vertical or horizontal type. With the vertical machine, the faces to be milled will naturally be at some distance up from the table surface, as suggested in Fig. 1. This positioning in the fixture will therefore tend to induce some unavoidable chatter, due partly to cutter thrust and partly to the "sing" that is inherent in thin-walled castings under all but ideal conditions.

By milling on a horizontal machine, as suggested by Fig. 2, the part will be held closer to the table and the cut will be downward against the table, thereby greatly reducing if not entirely eliminating chatter. For that matter, the part could be milled, without a fixture, by merely providing suitable backing stops and clamping directly to the table. Such simple tooling would serve for small-lot runs.

However, the fixtures shown are "designed" for small-lot production, and are simple in construction. To all practical purposes, the fixtures for the vertical setup—Fig. 1—is an angle plate on which the part is located on and between two stepped stops, and clamped by means of simple strap clamps. It might be argued that a center clamp should be added, for clamping against the hub; but, unless the stud were detachable this would complicate loading and would add little to the efficiency of the tool.

In the horizontal fixture, the part is located between pins on swinging stops, the latter receding to facilitate loading and unloading. Only two clamps are shown, although a third could be added, like the one shown in Fig. 1. The part rests on hardened wear strips which need not be ground inas-

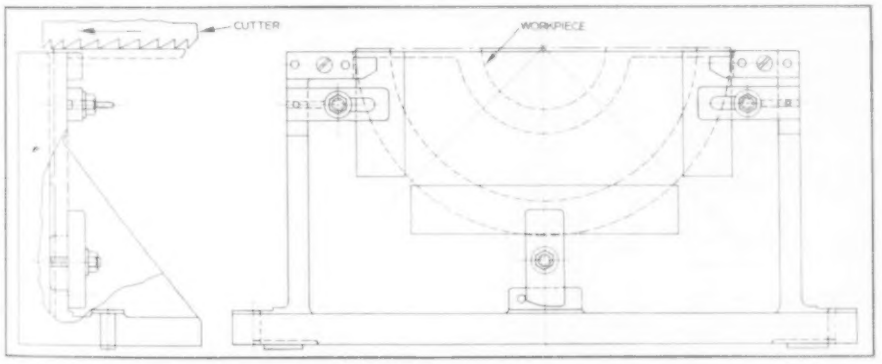
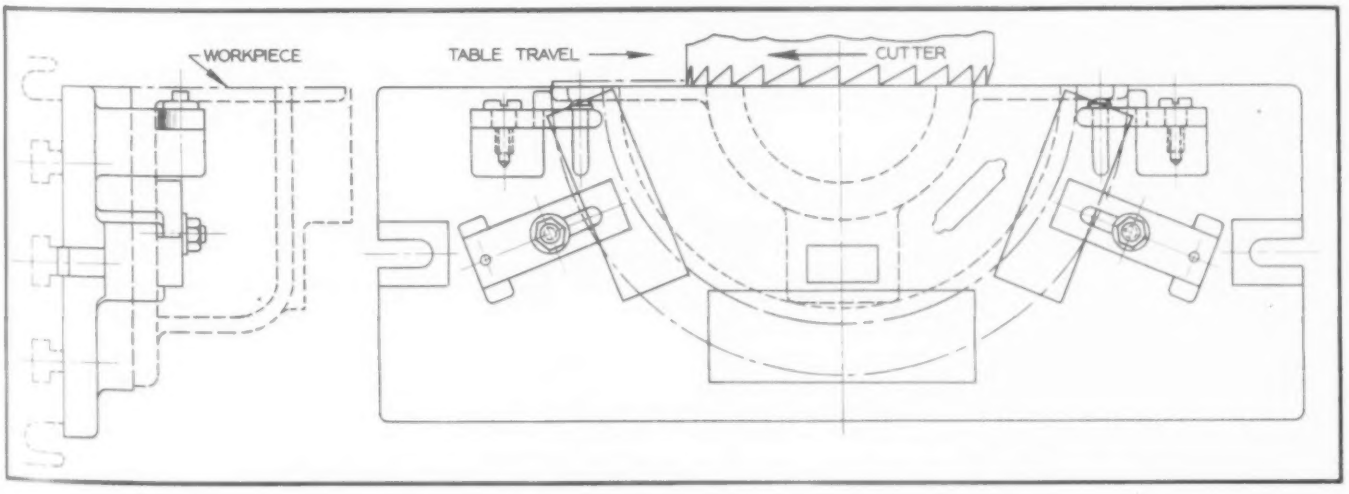


Fig. 1, at left, shows the part set up to mill mating flanges on a vertical miller. Fig. 2, below, shows setup for machining the flanges on a horizontal miller, as outlined in the Operation Sheet, preceding installment. While conditions may be assumed to be equal in both cases, the horizontal setup permits the part to be clamped closer to the table with the cut downward against the table, thereby reducing the chatter which is usually incidental to milling thin-walled castings. The fixtures shown are of simple construction, designed for small-lot production. For mass production, dual fixtures—shuttle, swivel or tandem with the cutter in between—would permit loading and unloading one part while the other was being milled. In either case, the fixtures should be designed to take both parts. Note the stops—swinging in the horizontal installation—for locating against the back of the flanges.



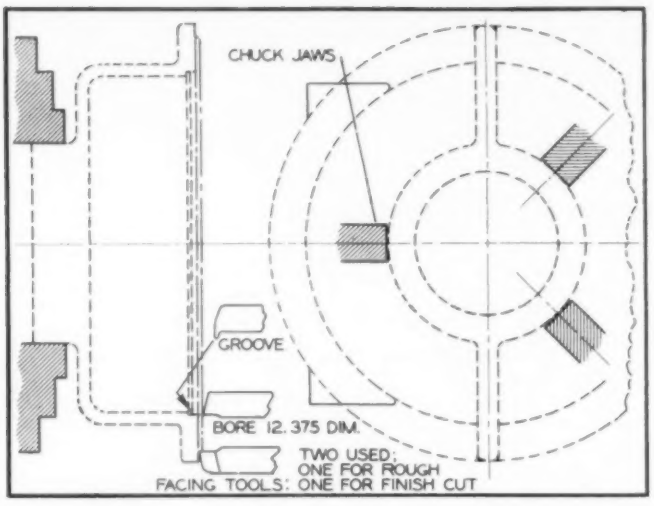


Fig. 3, showing the simple tooling for facing the flange, boring the 12.375 in. diameter and undercutting. The part is held in a universal chuck and the four tools used may be held in a tool post turret. This setup is for small-lot runs. For mass production, a fixture should be used with stops against the back of the circular flanges, also, the 12.375 in. dim. should be bored with a finishing tool held in a heavy cutter head with the bar running in a guide bushing.

much as the bearing face of the part is rough at this stage of processing. Either of the two types of fixture should take both parts.

As previously stated, the tooling shown is for small-lot production. For mass production, the tooling would vary with output demand. Thus, the parts could be continuously milled on a special machine, or on a vertical miller provided with a continuously rotating table mounting a number of fixtures. For that matter, output could be stepped up with the tools illustrated by using two fixtures in tandem, with the cutter in between. Thus, one fixture could be loaded and unloaded while the other would be working. We may take that up in a later installment.

For the time being, we will also defer discussion on the drilling of the holes in the vertical and round flanges, and go on to the machining of the circular flange and the hub end. For these operations, we will assume that the mating holes have been drilled and tapped, and that the two components have been assembled.

For small-lot production, the assembled unit may be chucked in a 3-jaw universal chuck, as shown in Fig. 3, and machined with standard tools. The facing tools may be held in a toolpost turret, if the machining is done on an engine lathe, or in the front and rear tool holders of a turret lathe. Only two cuts should be necessary—one roughing, one finishing.

While the recessing bit would have to be ground to suit the groove, it would otherwise be standard. The same holds for the boring tool for the 12.375 in. dimension, for which a stop should be provided to insure repetition of dimension. For gaging this dimension, a simple "Go" and "No Go" gage should be provided although a vernier caliper will serve for small-lot runs.

For mass production runs, the part should be machined in a turret lathe equipped with a special working-holding fixture. The facing tools would function as described above, but the boring and under-cutting tools should be held in the turret and guided, either by overhang guide bars or by piloted bars running in a rotary bushing. In this connection, the rotary bushings are recommended because they provide longer life with sustained accuracy.

It should be noted, here, that in chucking the part on the hub there is lacking that solidity which would be obtained with a fixture so designed that the flange would bear against stops, of which there would be three to prevent rock. The solidness thus gained would permit higher cutting speeds and faster feeds than would be possible with chucking on the hub. Again, the method would depend on the quantity to be machined and the required output per hour.

When it comes to the hub end, the logical procedure is to use a flanged work holding fixture regardless of whether the setup is for small-lot runs or mass production. The drawing, Fig. 4, suggests the general type of design. The part would be located on the 12.375 in. diameter and, naturally, with the previously faced flange against the face-plate. It could be clamped down as shown, or, air-operated clamps could be incorporated.

Because the 5.512 in. diameter is the important dimension, and will be precision bored in a later operation, the other diameters need not be held to particularly close tolerances. The groove is for a felt seal, and the other diameters are clearance to all practical purposes. However, the 5-3/16 in. diameter should be held fairly close—say plus or minus 0.003 in.—for use as approximate locating point for later operations. Note, in this connection, that dimensions are stated in bilateral or unilateral tolerances—that is, one-way or two-way, depending on the mating part. Of this, more later.

The steps may be bored with several tools, or with a stepped tool as shown. If stepped tools are used, one tool should be used for roughing, another for finishing. If so desired, the facing tool could also be combined with the stepped tool although, since the facing can be done simultaneously with the boring, there would be no economy in such combination.

Installment No. 10 will follow in the April issue, The Tool Engineer.

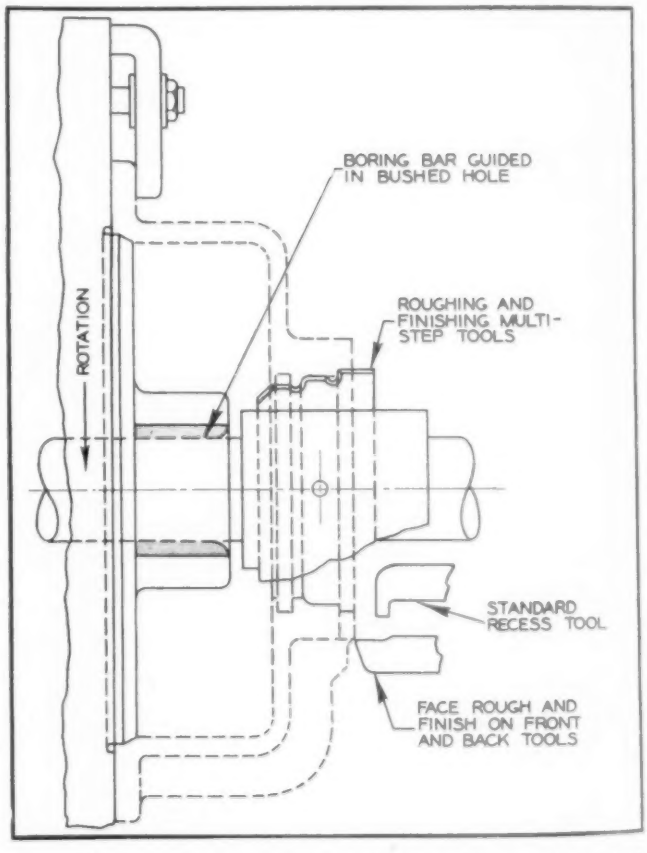
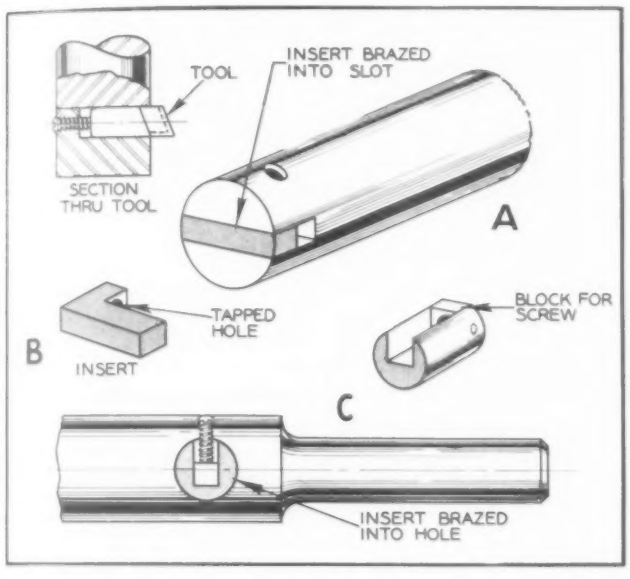


Fig. 4 shows the simple tooling for boring and facing the hub end of the part. The facing tools—roughing and finishing—are held in the front and back tool posts of the cross slide of a turret lathe, or in a tool post turret if the part is machined on an engine lathe. Inasmuch as extreme accuracy is not required for the bore in this operation, the several steps may be machined with stepped cutters, as shown. However, the bar should be piloted, preferably in a rotary bushing, especially so for high production. The stepped cutters are readily adaptable to an engine lathe as the bar may be held in the lathe tailstock spindle.

GADGETS

Boring Bar Fabricated for Brazing



The two types of boring bars shown can be made without use of a broach to machine the square or rectangular slots which hold the tool bits. It is merely necessary to mill slots directly in the bar, and to braze in an inset. Or, a round inset may be slotted and then brazed in place.

When it is necessary to construct a boring bar for square tool bits, without a broach or means of machining the square hole, a built-up design using silver-alloy brazing can be substituted, as illustrated. For the bar at *A*, the first operation is to mill a slot in the end. The machined insert *B*, then is fitted to the slot, and brazed in place by means of a torch. The insert has an offset, corresponding to the width of the toolbit, which is provided with a tapped hole for the adjusting screw. A section through the insert is shown at the upper left.

Another fabricated type of bar is shown at *C*. For this design, a crosshole is drilled and reamed crosswise in the bar. Then, the insert is fitted into the hole, and brazed in place. The insert, as may be seen has a rectangular slot milled in at the top, and is provided with a block at one end for the adjusting setscrew.

Clearances for brazing inserts of either type should be approximately 0.001 in. on a side. The entire assembly should be heated through to a temperature of about 1250 deg. F., then the silver alloy in wire form should be applied to the joints. Capillary action will "pull" the alloy well into the joints if the assembly is properly heated. A liberal amount of flux should be applied to both parts prior to heating, and likewise they should be free from oil or dirt.

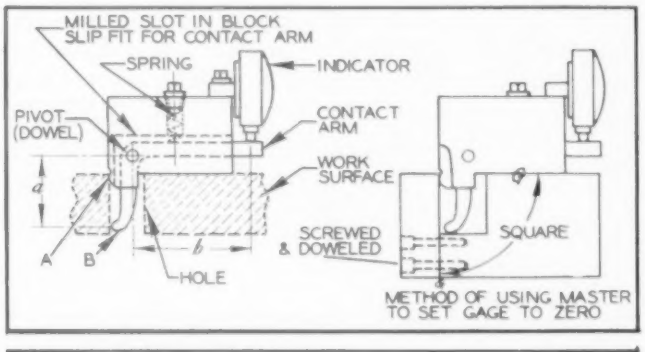
Built-up bars of this kind are as solid and as efficient as solid designs. Various modifications can be arranged, such as for angular toolbits, or even multiple tools. One of the bars shown is used for "blind" boring, while the other lends itself to a piloted-type bar.

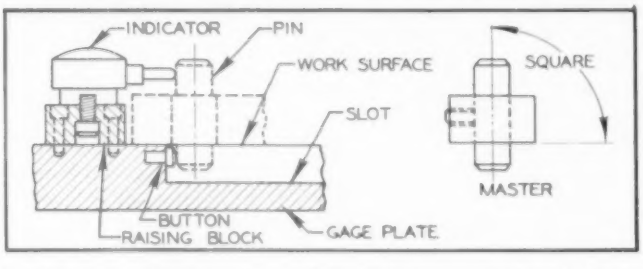
C. W. Frank, Springfield, Mass.

Two Squareness Gages

It was required to check the squareness of a hole with the surface into which it was bored within a few "tenths" and then to check the squareness of a pin pressed into the same hole with relation to the same surface with equal accuracy.

Fig. 1 shows the construction of the hole gage. A contact arm is pivoted inside a slotted block so that one end of the arm touches the lower end of the hole with the gage in position, while a dial indicator bears on the other end of the arm. The spring inside the block maintains pressure on the arm and assures proper gaging pressure.



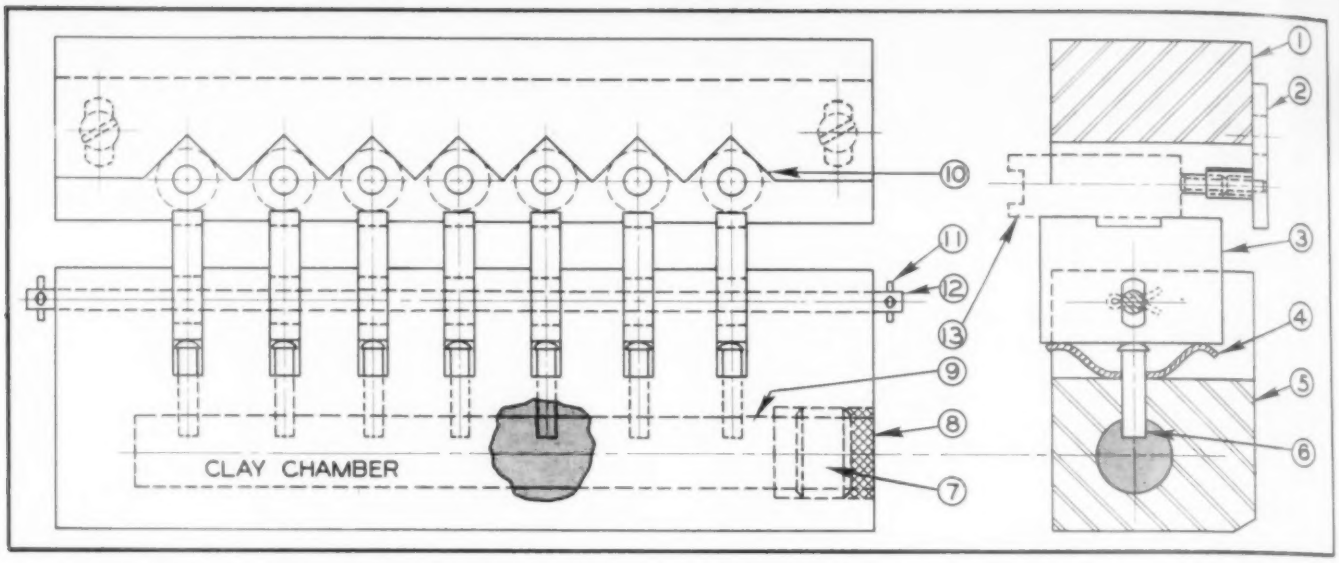


The two gages shown may be used to check squareness, in addition to serving as comparator gages. Construction is fairly simple and both may be set with masters as illustrated.

In use, the gage is inserted into the hole as shown until the fixed point "A" bears against the side of the hole. Since "B" will then touch the lower end of the hole a reading of the indicator will show the deviation from squareness, zero reading having been obtained through the use of a master, as shown. By making distance "b" a multiple of "a" the sensitivity of the indicator may be increased.

Fig. 2 shows the same part with a shoulder pin pressed into the same hole. The two small diameters of the pin had previously been inspected for equal size and concentricity well within the limits of the required squareness. By sliding the part onto the gage with the lower projection of the pin fitting into a clearance slot and being held against the button a reading of the indicator bearing against the upper part of the pin showed the deviation from squareness, zero reading having been determined with the master shown.

Paul H. Winter,
Syracuse Chapter ASTE



The equalizing fixture shown incorporates modelling clay or other plastic material to provide equal pressure on all of the parts held for milling or grinding. While shown as vise jaws, the principle can be applied to any type of equalizing fixture.

Equalizing Fixture for Round Work

An equalizing fixture for holding round work that may vary in diameter up to 1/16 in., more or less, can be made by using a plastic material as the equalizing medium. While design can be varied to suit work, the fixture shown consists to all practical purposes of two components which may be used as jaws in a milling vise.

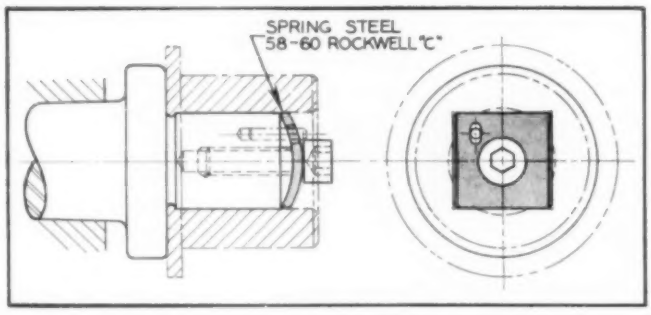
One jaw contains a number of Vees, which should be spaced to suit the diameter of the work, while the other contains the equalizing medium—here shown as modelling clay. The clay is contained in a chamber, plugged at one end and having a series of reamed holes opposed to the center line of the Vees.

The tool consists of fixed and movable jaws, Details 1 and 5; a plate 2 for holding adjustable "jacks" for height of work; pressure member, 3; spring 4; pins 6—the latter a close fit in the reamed holes; plug 7 and seal 8; chamber, 9; Vees 10; keeper pin and retaining rod, 11 and 12. The workpiece is designated by number 13.

For use, the chamber should be tightly packed with the clay with the pins in place. By removing one pin, to provide a vent hole, the rest of the pins can be aligned, after which the last pin can be inserted. Under pressure of clamping, the clay will "flow" much after the manner of a hydraulic fluid, to provide equal pressure on all of the workpieces.

Frank J. Peragine
South Hempstead, New York

Expanding Washer for Broached Work



Drawing up on the curved washer expands it against the inside of the part held on the work-holding arbor. The washer must be spring tempered so as not to "cam" on release.

Workpieces which have previously been broached may be securely held on an arbor or adapted, for such second operation work as turning, facing or other operations, by means of an expanding washer as shown. In this case, the work is shown with square hole and the washer and adapter can naturally be changed to suit other shaped holes.

The adapter is made in one piece, with one end shaped to suit the work, the other end to suit the spindle taper. The washer is made slightly smaller than the hole in the work, when curved, and is kept from turning by a keeper pin. Once the work has been slipped onto the arbor, it is only necessary to tighten the screw to expand the washer against the sides of the hole for a firm grip.

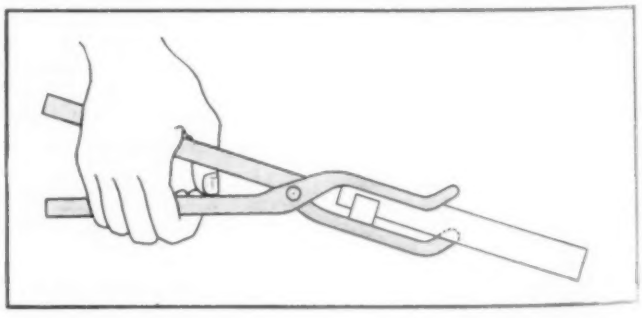
George G. Hasselberg
Rochester, N. Y.

The Tool Engineer pays regular page rates for accepted contributions to these pages, with a minimum of $5.00 for each item.

Lipped Tong for Heavy Work

When material being handled by tongs is heavy, it is necessary for the operator to maintain a firm grip lest the work swing sideways. Tension can be eased and the job made easier by adding a lip on alternate sides of the upper and lower jaws of the tong, as illustrated. With this addition, sideways movement will be arrested by the lips and less tension will be required for the operator's hand.

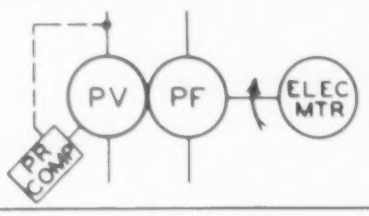
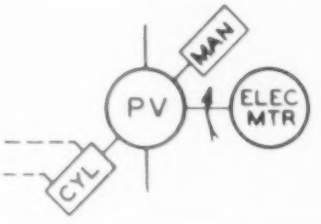
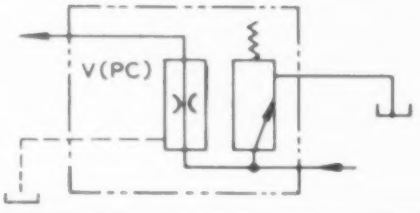
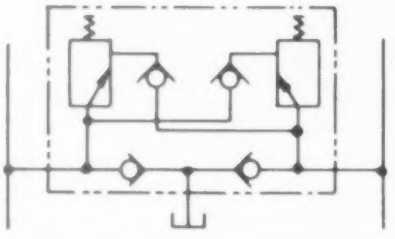
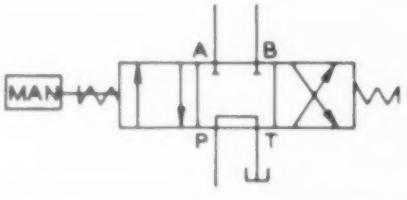
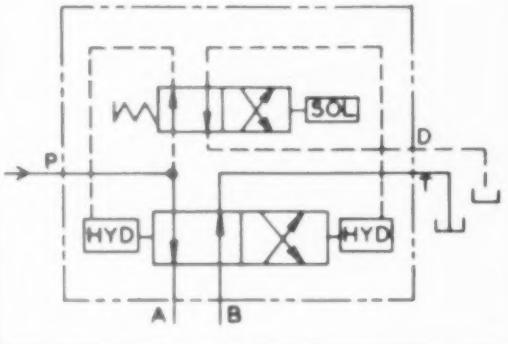
E. Guilbert, Chicago, Ill.



Lips on the side of a tong prevent side sway of heavy work and ease tension on the tong.

TOOL ENGINEERING DATA NUMBER TWO

J. I. C. Standard Symbols for Industrial Hydraulic Equipment

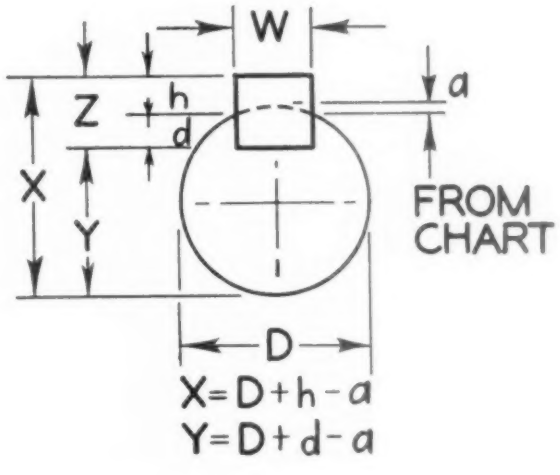
EXAMPLES OF COMBINATIONS	
PUMP, DOUBLE-WITH ELECTRIC MOTOR ONE FIXED DISPLACEMENT ONE VARIABLE DISPLACEMENT WITH PRESSURE COMPENSATOR	
PUMP, SINGLE-WITH ELECTRIC MOTOR VARIABLE DISPLACEMENT HAND WHEEL & CYLINDER CONTROL	
VALVE, FLOW CONTROL & MAXIMUM PRESSURE WITH COMPENSATOR	
VALVE, REPLENISHING UNIT	
VALVE, 4 WAY THREE POSITION-SPRING CENTERED MANUAL CONTROL P→T, CYL. PORT BLOCKED IN CENTER POSITION (NOTE: SYMBOL SHOWN IN CENTER POSITION)	
VALVE, 4 WAY 2 POSITION-SPRING OFFSET SOLENOID CONTROL PILOT OPERATED	

Adopted by the joint Industry Conference, sponsored by Automotive Joint Industry Conference, Hydraulic Equipment Manufacturers, Hydraulic Press Manufacturers, National Machine Tool Builders Association, Resistance Welder Manufacturers Association, Tubing and Fitting Manufacturers.

Keyway Depth Chart

Diam. Hole	KEYWAY WIDTH = W										
D	1/16	3/32	1/8	3/16	1/4	5/16	3/8	1/2	5/8	3/4	7/8
1/4	.0040	.0091									
5/16	.0032	.0072	.0130								
3/8	.0026	.0060	.0107	.0251							
7/16	.0022	.0051	.0091	.0211	.0392						
1/2	.0020	.0044	.0079	.0182	.0335	.0548					
9/16	.0017	.0039	.0070	.0161	.0293	.0474					
5/8	.0016	.0035	.0063	.0144	.0261	.0419	.0625				
11/16	.0014	.0032	.0057	.0130	.0235	.0376	.0556				
3/4	.0013	.0029	.0052	.0119	.0214	.0341	.0502	.0955			
13/16	.0012	.0027	.0048	.0110	.0197	.0312	.0459	.0860			
7/8	.0011	.0025	.0045	.0102	.0182	.0288	.0422	.0785	.1313		
15/16	.0010	.0023	.0042	.0095	.0170	.0268	.0391	.0722	.1194		
1″	.0010	.0022	.0039	.0089	.0159	.0250	.0365	.0670	.1097	.1693	
1-1/16	.0009	.0021	.0037	.0083	.0149	.0235	.0342	.0625	.1016	.1550	
1-1/8	.0009	.0020	.0035	.0079	.0141	.0221	.0322	.0586	.0948	.1432	.2089
1-3/16	.0008	.0019	.0033	.0074	.0133	.0209	.0304	.0552	.0889	.1334	.1923
1-1/4	.0008	.0018	.0031	.0071	.0126	.0198	.0288	.0522	.0837	.1250	.1787
1-5/16	.0007	.0017	.0030	.0067	.0120	.0189	.0274	.0495	.0792	.1177	.1671
1-3/8	.0007	.0016	.0028	.0064	.0115	.0180	.0261	.0471	.0751	.1113	.1572
1-7/16	.0007	.0015	.0027	.0061	.0110	.0172	.0249	.0449	.0715	.1056	.1485
1-1/2	.0006	.0015	.0026	.0059	.0105	.0165	.0238	.0429	.0682	.1005	.1408
1-9/16	.0006	.0014	.0025	.0056	.0101	.0158	.0228	.0411	.0652	.0959	.1340
1-5/8	.0006	.0014	.0024	.0054	.0097	.0152	.0219	.0394	.0625	.0917	.1278
1-11/16	.0006	.0013	.0023	.0052	.0093	.0146	.0211	.0379	.0600	.0879	.1223
1-3/4	.0005	.0013	.0022	.0050	.0090	.0141	.0203	.0365	.0577	.0844	.1172
1-13/16	.0005	.0012	.0022	.0049	.0087	.0136	.0196	.0352	.0556	.0812	.1126
1-7/8	.0005	.0012	.0021	.0047	.0084	.0131	.0189	.0339	.0536	.0783	.1083
1-15/16	.0005	.0011	.0020	.0045	.0081	.0127	.0183	.0328	.0518	.0755	.1044
2″	.0005	.0011	.0020	.0044	.0078	.0123	.0177	.0318	.0501	.0730	.1008

$$a = \frac{D - \sqrt{(D+W)(D-W)}}{2}$$



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A Year of Attainment

Nationally and Locally, Society Reaches Significant Goals, Nears Others in '48-49

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13/16	.0012	.0027	.0048	.0110	.0197	.0312	.0459	.0860			
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1-5/16	.0007	.0017	.0030	.0067	.0120	.0189	.0274	.0495	.0792	.1177	.1671
1-3/8	.0007	.0016	.0028	.0064	.0115	.0180	.0261	.0471	.0751	.1113	.1572
1-7/16	.0007	.0015	.0027	.0061	.0110	.0172	.0249	.0449	.0715	.1056	.1485
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1-9/16	.0006	.0014	.0025	.0056	.0101	.0158	.0228	.0411	.0652	.0959	.1340
1-5/8	.0006	.0014	.0024	.0054	.0097	.0152	.0219	.0394	.0625	.0917	.1278
1-11/16	.0006	.0013	.0023	.0052	.0093	.0146	.0211	.0379	.0600	.0879	.1223
1-3/4	.0005	.0013	.0022	.0050	.0090	.0141	.0203	.0365	.0577	.0844	.1172
1-13/16	.0005	.0012	.0022	.0049	.0087	.0136	.0196	.0352	.0556	.0812	.1126
1-7/8	.0005	.0012	.0021	.0047	.0084	.0131	.0189	.0339	.0536	.0783	.1083
1-15/16	.0005	.0011	.0020	.0045	.0081	.0127	.0183	.0328	.0518	.0755	.1044
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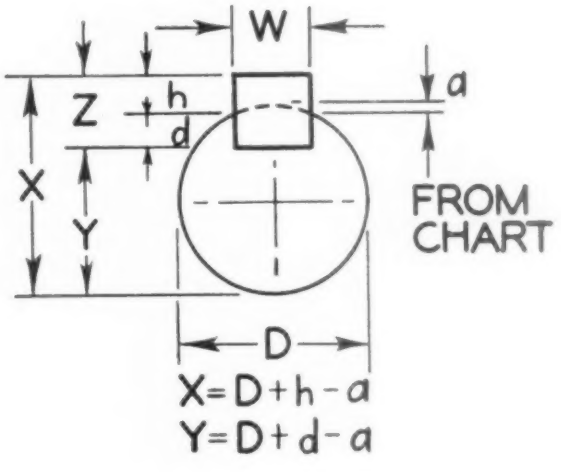
$$a = \frac{D - \sqrt{(D+W)(D-W)}}{2}$$



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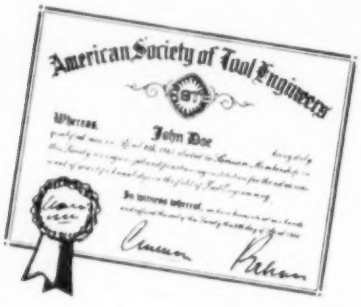
Housed in a nearly sound-proof room, the automatic machinery of the Society's accounting system does not disturb workers in other parts of ASTE central office

Chairman F. J. Dawless of New Haven, Conn.

Thirteen chapters boosted their membership. Hartford contributed the largest number — 58, and Pontiac showed the highest ratio of increase — 30 percent. The At Large group made a gain of 59. In countries outside the North American continent, Australia and England lead the membership list.

To facilitate contact between At Large members, the Membership Committee



mailed a roster of this group to each member on the list. Through a chatty news sheet it keeps chapter officers and membership men informed of committee activities.

Although a net loss of 970 members was sustained from April 1 to December 31, the membership rolls are now in a more healthy condition. A large number of members held on the Armed Service list have been dropped as they cannot be located.

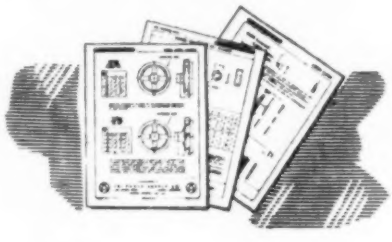
The Standards Committee distributed the fifth and sixth sets of numerically indexed data sheets. A seventh, due this month, will include engineering information data sheets.

These mailings complete the contracts on hand, Standards Chairman L. B. Bellamy of Detroit has announced. But additional data sheets from 75 manufacturers are being prepared. Sheets from 38 companies are already approved.

Personal contacts with chapter standards committees and area manufacturers and at regional meetings have stimulated local committees to greater data sheet promotion.

The Canadian National Standards Committee mailed a set of data sheets to Dominion members. Eight companies have sheets in preparation; of these, four have approval for printing.

One ASTE member has been appointed to the Canadian Standards Association. In the United States the Standards Committee continues to add appointees to American Standards Association sectional committees.



Under the direction of E. W. Baumgardner of Cleveland, the Program Committee handled arrangements for the semi-annual meeting at Los Angeles in October. For the present Pittsburgh convention, it delegated full responsibilty to the host chapter.

Speakers participating in the Pittsburgh program received copies of a new technical paper manual, jointly prepared by several national committees, for guidance in writing their papers. Preprints of these manuscripts are available on application.

A new speakers' directory, being sent to chapters this month, will assist incoming chapter program chairmen in planning their season schedules. The committee has continued its endeavor to promote speaker tours and has issued occasional bulletins on speaker data. Nine chapters are now using its standardized meeting notice.

Applying itself to improving the editorial contents of *The Tool Engineer*, the Editorial Committee, with F. W. Curtis of Springfield, Mass., as chairman, has set up a classification chart for technical articles and a quota for each, along with space allocations for all departments and features.

To carry out their program, the committee engaged Gilbert P. Muir of McKeesport, Pa., as editor.

Cumulative indexing of contents has been resumed and a chart of chapter news contributions is issued bi-monthly to chairmen and editorial chairmen of all chapters.

The committee, in cooperation with the national officers, is now formulating plans involving responsiblity for the entire publication and management of the magazine.

Rhode Island State College and Rochester Institute of Technology have been added to the list of schools offering ASTE-approved tool engineering curricula, Education Chairman H. F. Owen of Lafayette, Ind., has announced. Institutions previously qualifying are: Williamsport Technical Institute, Connecticut Engineering Institute and Ford of Canada Trade School. Encouraging progress is also noted in the number of universities introducing tool engineering subjects.

Crowds thronged the ASTE exposition at Cleveland last March. Show was a highlight of Society's year

The manufacturing analysis text prepared by Rochester Institute of Technology is scheduled for publication late this summer. "Jig and Fixture Design" is now in its second printing.

Locally there is considerable educational activity. A number of chapters offer scholarships, student prizes and tool engineering courses. Stories of these projects appear frequently in *ASTE News*.

Eight chapters sponsor student groups. They are: Fort Wayne, Tri-State College; Indianapolis, Purdue University;

Detroit, Detroit College of Applied Science; Kansas City, University of Kansas; Columbus, Ohio State University; Pittsburgh, Westinghouse Electric Corp.; Peoria and Boston, groups representing several institutions.

During 1948 Seattle chapter won a tool engineering classification from the Washington State License Board — a mark for other chapters to shoot at. In Ohio seven ASTE chapters met and discussed an approach to action concerning registration laws.

At Detroit, says Professional Engineering Chairman W. A. Dawson of Hamilton, Ont., successful refresher courses are given by the Engineering Society of Detroit, of which Detroit chapter, ASTE, is an affiliate. These courses prepare applicants for examination for professional registration. In addition, several groups of Detroit engineers have engaged a teacher and study at their own pace.

The national program of the ASTE Committee on Professional Engineering is now pending action by the Board of Directors.

While these accomplishments do not constitute all the Society's work for the year, they summarize the annual reports available at press time.

Looking forward with A. S. T. E.

By HARRY E. CONRAD, *Executive Secretary, ASTE*

Once in a great while it seems entirely proper and fitting that any organization, regardless of its functions or its achievements, should pause and evaluate its past, present and future. This seems an ideal and logical time for ASTE to take stock of its progress and look into its future.

For those who have kept a sensitive finger on the pulse of ASTE activity, there can be no doubt that we have progressed as a technical society. There is also ample evidence that tool engineering as a profession has advanced, not only in the techniques employed by its practitioners, but in prestige and recognition from many quarters. Industry, educational institutions, other engineering groups and the general public have a better understanding of tool engineering and a greater respect for its place in a modern society and economy.

Progress in Technical Writing

It appears to be an established historical pattern that a profession advances and is accepted in direct relationship to the development of its technical literature. There are few fields in which literature has developed faster or in better quality than in the field of tool engineering.

The American Society of Tool Engineers has taken constructive strides in making available to its members, students, educational institutions and industry, text books and data which are being accepted as standard academic and practical reference material.

By July of this year, we will have published and started distribution of the "Tool Engineers' Handbook." This will be the largest single and most outstanding contribution to the literature of the profession.

While the publishing of this work represents a large investment by the Society, there are indications that no other activity or program engaged in thus far shows a potential gain of nearly as much prestige for tool engineers. Unusual demand for this book seems not only possible but most probable.

Cooperating in Standardization

The ASTE is keeping abreast of the present trends in standardization. We have long realized that the setting up and maintenance of necessary standards are vital to the proper operation of scientific engineering and management.

It is important that one of the significant trends in the field of standards is its movement from government domination toward operation on a voluntary basis by industry. The ASTE is cooperating closely with the American Standards Association in all matters related to tool and production engineering.

Last year, the Society developed a system for the numerical classification of standards and data sheets. This system is divided into two sections: a numerical listing and an alphabetical listing. The numerical listing is used to classify and file data sheets and other technical and mechanical information to which the correct numbers have already been assigned. The alphabetical listing is used to locate specific material when the user does not know the code number applicable to the product or process on which he is seeking the information.

Index Useful to Industry

Many new uses were found in industry for this index and engineers and manufacturers alike hailed the work as an important milestone in standards progress. Both the data sheets and the index are being expanded and improved.

It is generally agreed that the technical papers and seminars presented at our national meetings have shown a marked improvement. Machinery has been set into motion which will further raise the calibre of material presented at the annual and semi-annual conventions.

Steps are being taken to improve the programs and material presented at chapter meetings. Plans are being made for bringing this material to such a consistently high level that the papers presented at local chapter meetings will be used to comprise the greater portion of editorial content in our magazine, *The Tool Engineer*.

By the end of this year, the Society will take over entirely the publishing of

Flint Chapter Awards Prizes to Outstanding Students

Charles Bierwirth of Buick Motor Div., General Motors Corp., is awarded a year's membership in Flint chapter, a membership pin and a season dinner ticket in recognition of his fifth-year project which earned him a bachelor's degree in industrial engineering at General Motors Institute. Mr. Bierwirth's project was "A Study of Cutting Face Finishes and Treatments on Twist Drill Performance." Ray Eifler and Robert Stoathoff, fourth-year students co-operating with Fisher and A. C. Spark Plug divisions of General Motors respectively, also received a year's membership. Shown at right are E. A. Reed, senior technical instructor at the institute and chapter education chairman (presenting award), and R. W. Cook, time study engineer at the G. M. Chevrolet plant and chapter chairman

The Tool Engineer. Offices of the publication will be moved into the new headquarters building and an expanded and improved editorial program will be instituted.

Our cooperation with and service to educational institutions is gaining ground. We are getting closer to our goal and more and better courses in tool engineering and soon we will be in sight of our target: a degree in tool engineering granted by accredited engineering schools.

The wheels are beginning to turn on our 1950 tool show. The 1948 show was larger and more successful than the one in 1946. By the same token, every sign points to an even greater exposition in 1950. The ASTE tool show has become so well established, since the 1946 show, that today it is recognized as one of the best conducted, most efficiently operated industrial fairs in America. Exhibitors are convinced of the value and profit to their enterprises in these shows and already space orders are coming in for exhibit space in 1950.

The new ASTE headquarters is an outward symbol of progress. Behind the functional walls of this building is conducted a well-ordered, growing technical society which each year is gaining new influence and greater prestige.

Each year through its expanding activities, ASTE is offering new services to industry—and each year industry is accepting and utilizing more of these services. Each year the Society is able to perform better services to its members and gain greater recognition for tool engineering. By offering greater services, the Society's membership shows a steady increase.

Through all of this activity, the body politic and the economy in general are benefiting—because tool engineers, better tool engineers, are finding the ways quicker to more and better products for less cost to the consumer. One could say that the story of the tool engineers is the story of American industry . . . the American system . . . yes, the story of America itself. That story is one of progress through incentive.

Rivkin Gives Pointers for Conserving Diamond Tools

Worcester, Mass.—Ten commandments for diamond tool conservation highlighted an address by I. E. Rivkin, regional sales manager, Molina Industrial Diamond Co., Inc., New York City.

Speaking before a dinner meeting of Worcester chapter, January 4, Mr. Rivkin laid down the following rules for diamond users: (1) Size of diamond should be in proportion to size, hardness and grain size of grinding wheel. (2) Protect diamond against accidental blows when not in use. A short length of rubber tubing will serve the purpose. (3) Frequent dressings are economical because irregularities to be corrected are small.

(4) Truing device must be rigid and diamond tool properly supported with minimum overhang, to avoid vibration. (5) Diamond cuts should not be deeper than 0.001 in., with wheels turned at proper grinding speed. However, large wheels and thread grinding wheels require reduced speed in truing. (6) Pass diamond slowly across wheel face for high finish, rapidly for stock removal. Truing a grinding wheel periphery should start at high point as corners are often worn smaller.

(7) Use plenty of coolant if grinding is wet; if dry, dress dry, but allow frequent cooling periods. A hot diamond should never be cooled quickly. Immersion may cause it to crack. (8) Diamond should be inclined at 5 deg to 15 deg toward wheel, pointing in direction of wheel rotation. It should contact wheel slightly below center line, never above it.

(9) Turn diamond frequently to insure continual sharp points and regular wear. If too broad a flat develops, it will press the grain into the bond, producing a glazing effect and reducing cutting action. (10) When the exposed part of a diamond is no longer useful, it should be reset.

In narrating the background of diamonds—both industrial stones and gems—Mr. Rivkin observed that diamonds have been found sensitive to radio-activity and are used to measure radiation.

Other News In This Issue

Tri-Cities Chapter Entertains Ladies on Tenth Anniversary

Tri-Cities chapter observes tenth anniversary with ladies night meeting at Hotel Blackhawk, Davenport, Iowa. Top: Approximately 100 members and guests, including representations from Kewanee, Ill., and Cedar Rapids chapter, watch entertainment. Inset: Theodor Le Vander, associate professor of speech, Augustana College, addresses group

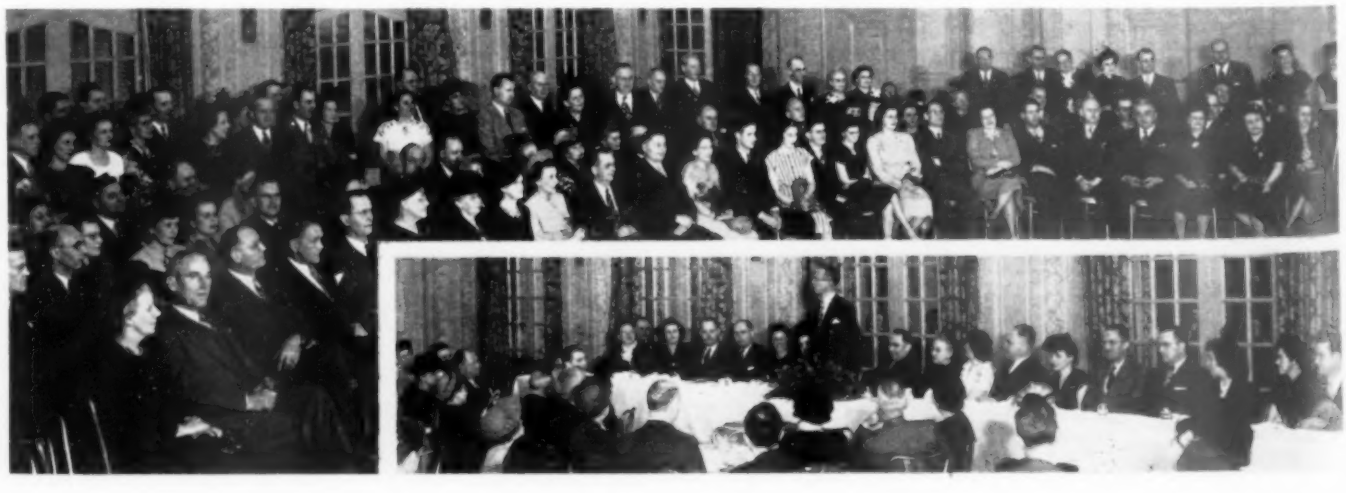


Photo Courtesy Utica Daily Press

Officers elected during Mohawk Valley chapter chartering are from left, seated: A. K. Schroeder, second vice-chairman; E. J. Masucci, chairman; F. L. Barker, first vice-chairman; standing: J. D. Blair, delegate; Paul Lyman, secretary; N. A. Kinney, treasurer; and A. C. Delmont, alternate. Right: President Irwin F. Holland presents the charter to Chairman Masucci at ceremonies in Utica Technical Institute, Utica, N. Y., as Mr. Schroeder, Mr. Barker and H. E. Conrad, Society executive secretary, look on

Holland Charters Utica Group as Mohawk Valley Chapter

The 78th chapter of the American Society of Tool Engineers was formally established January 25, when President Irwin F. Holland handed a charter to Ernest Masucci, newly-elected chairman of Mohawk Valley chapter.

Chartering of the new group of 70 members took place during an evening meeting at Utica Technical Institute, Utica, N. Y.

Officers elected prior to the ceremony included first vice-chairman, Frederick L. Barker, tool designer, Tabulating Machine Div., Remington Rand, Inc., Ilion; second vice-chairman, Arnold K. Schroeder, assistant chief tool engineer, Bossert Div., Timken-Detroit Axle Co.; secretary, Paul K. Lyman, chief tool designer, Tabulating Machine Div., Remington Rand Co.; treasurer, Nicholas A. Kinney, instructor of mechanical technology, Utica Technical Institute; delegate, J. D. Blair, director of engineering, Divine Bros. Co.; and alternate, Albert C. Delmont, chief engineer, Horrocks Ibbotson Co.

Led Ten Months' Groundwork

These men were active in the organization work, begun last March and headed by Mr. Masucci, instructor of mechanical technology, Utica Technical Institute.

During the precharter period, Mr. Masucci, an At Large member, served as temporary chairman. He is a charter member of Rome chapter, ASM, and a member of the American Society for Engineering Education. Mr. Barker transferred from Syracuse chapter. Mr. Schroeder served on the organizing and program committees. He is a past president of the Utica Industrial Club.

In the early stages of chapter organization, Mr. Kinney was secretary protem. A former chairman of Dayton chapter, Mr. Blair was prominent in promoting the formation of a chapter at Utica and served on several committees. Mr. Delmont headed the program committee. He is a member of ASME.

Mr. Holland conducted the election and installation of officers before presenting the charter to Mr. Masucci. He then addressed the chapter concerning the Society, its purposes, aims and accomplishments.

V. H. Ericson, third vice-president; F. J. Dawless, national membership chairman; and H. E. Conrad, executive secretary, also were present and spoke briefly on various phases of ASTE activity.

Represents Industry Cross-Section

Charter members include: Frederick A. Shultz, chief engineer, Russell M. Ramsay, supervisor, tool and process engineering, Douglas W. Williams, William E. Webb and Benjamin Licari, tool designers, Everett J. Dunlop, processing engineer, Charles H. Miller and Herbert C. Mohr, tool engineers, and Daniel H. Bean, apprentice tool designer, Remington Rand, Inc.

Henry V. Drejza, toolroom foreman, Herbert C. Schulze, tool designer and engineer, Ralph H. Gschwind, refrigeration engineer, Harry W. Bedworth, tool engineer, Arthur G. Barnes and William J. Hoffman, engineers, and Frank M. Ward, toolmaker, Savage Arms Corp.

William K. Retzloft, supervisor, new arms unit, David M. Abbott, senior engineer, Earl K. Wheat, process development engineer, Newton M. Reed, tool designer, Mitchell H. Smith and Paul B. Croop, process engineers, Remington Arms Co., Inc.

Bernard A. Schnurr, president, Theodore M. Rozanski, tool designer, N. R. Detore, Jr., tool and die maker, and Ralph S. Fraats, toolmaker, Bossert Co.

F. E. Lagase, Jr., superintendent, plant 2, Alexander Lauterbach, superintendent, tool department, and R. E. Lauterbach, assistant supervisor, Horrocks Ibbotson Co.

Karl W. Standop, plant superintendent, Angus M. Brown, manager, metal finishing div., Stanley H. Klossner, product engineer, and Charles D. Yetman, tool designer, Divine Brothers Co.

Charles E. Chappel, development engineer, and Stephen V. Ciecko, tool designer, Utica Drop Forge & Tool Corp.; Vernon S. Cook, vice-president, H. F. Brown Machine Co.; Joseph A. Fernon and Ernest F. Merkelbach, partners, Fermer Tool & Die Co.; Alfred F. Despard, owner, and Norman F. Nahring, abrasive engineer, F. F. Despard Co.

Albert E. Steiger, assistant superintendent, Ralphard C. Lehman, machine shop foreman, and Carl C. Geiersbach, design engineer, Brunner Mfg. Co.; Robert B. Clark, time study and methods engineer, Foster Brothers Mfg. Co.; William F. Cobb, owner, W. F. Cobb Tool Co.

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Earl A. English, methods and development engineer, Union Fork & Hoe Co.; Lloyd R. Dickinson, factory manager, Kent Electric Corp.; Harry B. Edwards, toolmaker and draftsman, Revere Copper & Brass, Inc.; Fred D. Hamilton, tool engineer, Brace, Mueller, Huntley, Inc.

Francis C. Wameling, instructor, New York State Institute of Applied Arts and Sciences; John B. Lockwood, teacher, Board of Education, City of Utica; Fred W. Yutzler, chief engineer, and H. Theodore Maus, assistant engineer, The Kent Co., Inc.

Sherman R. Mears, instructor, tool design, Long Island Agricultural and Technical Institute; D. L. Vandemark, draftsman-machine tool designer, Rome Grader & Machinery Div., Union Fork & Hoe Co.; Herman A. Schnurr, president, Utica Plating Co.

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John H. Mitchell, manager, Syracuse Bearing Utica Corp.; John L. Pooley, partner-operating manager, Wesdon Engineering Co.; Donald J. Templeton, general mechanical engineer, The Flintkote Co.; Joseph M. Darman, manager-owner, Darman Mfg. Co., Inc.; Loren E. Holland, owner, Holland Engineering & Tool Co.; Charles H. Yetman, development engineer, American Emblem Co.; and Robert I. Belmont, abrasive engineer, Bay State Abrasive Co.

Plant Tour and Lectures Feature Member Program

Hamilton, Ont.—An afternoon tour of Wallace Barnes Co. preceded the annual Member Night program of Hamilton chapter, January 14.

Approximately 55 members assembled at the plant and observed the manufacture of springs from raw material through design, manufacture and testing. A revelation to many was the variety of type and application of springs produced—for equipment as dissimilar as railroad cars, baby buggies and desk staplers.

Highlights of the trip included fatigue testing mechanism for motor valve springs and closely controlled heat treating furnaces.

After the tour the group proceeded to Fischers Hotel where they were joined by other members for a social hour, dinner and technical session.

Three chapter members addressed the audience. Clarence Beingessner of B. & W. Precision Heat Treating Co., Kitchener, discussed design, and application of tool steels. Mr. Beingessner cited cases where poor design prevented good heat treating.

Hall Lectures on Springs

Chapter Chairman Gordon Hall of Wallace Barnes Co. supplemented the afternoon tour with a lecture, "Application of Springs." He presented technical aspects of the subject and answered questions concerning both the plant visit and his talk.

"This Society" was the theme of George Churchill of Massey-Harris Co., Brantford. A long-time member, Mr. Churchill reviewed the chapter's accomplishments and outlined the organization's aims and plans for the future.

John Walton, W. A. Alexander and Harry Whitehall, former chapter chairmen, were elected a nominating committee to draw up a slate of officer candidates.

* * *

A double header on plastics featured the preceding meeting, when approximately 75 members gathered at Fischers Hotel in Guelph.

T. J. Carey, manager, Plastic and Porcelain Div., Canadian General Electric Co., Toronto, lectured on "Molds and Tools for Plastics." Using charts he reviewed progress in mold and machine design for thermoplastic and thermosetting plastics. Slides were shown of awards for plastics applications in varied fields of design.

"Silicones—A New Field in Industry" was the subject presented by A. E. Byrne, manager, Chemical Div., Canadian General Electric Co.

Newest addition to the chemical industry, silicones, he predicted, are destined to play an important part in industries outside the plastics field. Their main role is to combat viscosities of fluids in changing temperatures.

During the evening William Orlick was elected second vice-chairman to succeed William Patterson who has a new business assignment in another town.

Television, Outgrowth Of Telephone Research

Indianapolis, Ind.—Emmett C. Belzer, a local representative of Indiana Bell Telephone Co., was guest speaker at the January 10 meeting of Evansville chapter. Held in the Science Building of Evansville College, the meeting was preceded by dinner in the college cafeteria.

In his talk, Mr. Belzer retraced the steps required before the human voice could be transmitted over great distances. At first it was by open wires, then as the number of telephones increased, hundreds of fine wires were enclosed in a lead covered cable.

Emmet C. Belzer of the Indiana Bell Telephone Co. displays an enlarged model of a new type of booster tube during talk at Indianapolis chapter. At left are M. G. Lewis, manager of the Evansville Bell Telephone Co. office, and Clyde Yost, chairman of the chapter

But before the cable could carry conversations without loss in volume, it was necessary to find a way of amplifying the voice as it sped along. Mr. Belzer explained the results of this research, how it affects everyone today in telephone, radio, radar and television fields.

A motion picture was shown of the Fastex camera, a development of Bell Laboratories photographing up to 4000 frames a second.

Following Mr. Belzer's talk, a nominating committee was elected to name candidates for chapter officers. This committee consists of Frank Hausfeld, chairman, Maurice Paris and Bernard Pampe.

Cedar Rapids Visits New Crane Plant

Cedar Rapids, Iowa—A tour of the new plant of Link-Belt Speeder Corp. opened the January 19 meeting of Cedar Rapids chapter. Company employees affiliated with the chapter served as guides, conducting the party in small groups.

Following a smorgasbord dinner at the Montrose Hotel, the group was entertained by Wallace Ris, Olympic and world's champion 100-meter free style swimmer. Mr. Ris related his experiences at the Olympic meeting in London last summer and his subsequent European trip.

David Armbruster, his coach at the University of Iowa, described fundamental swimming techniques and requirements for a champion swimmer.

I. S. Yanaway, J. M. Speck, M. J. Fitzgerald and E. O. Spangler were elected to serve as a nominating committee.

Metallurgists Collaborate In Materials Symposium

Springfield, Vt.—Chief metallurgists from three local plants presented a symposium on Materials Selection before approximately 60 members and guests attending a dinner meeting of Twin States chapter, January 12, at Trade Winds Cafe.

Henry Webster of Cone Automatic Machine Co., Inc., described characteristics of plain carbon steels and effects of alloying with other metals. The Jominy test, he explained, is a means of specifying hardenability characteristics desired when ordering steels.

An important point stressed by the speaker was that strength of a steel part is governed by design and material. For best results the engineer and the metallurgist should confer on their problems.

Highlights of the history of heat treating were reviewed by G. G. Leitch of Fellows Gear Shaper Co. In discussing tool steels, he named properties and general uses of various grades.

Slides Chart Non-Ferrous Metals

Third phase of the materials session was "Non-Ferrous Metals," presented by L. J. Sheehan of Jones & Lamson Machine Co. Accompanying his talk were slides of charts showing relationship of analysis of irons, brasses, bronzes and aluminum to tensile strength of each. The latter property, he emphasized, greatly affects machinability of many non-ferrous metals.

Alloying and reasons for alloying aluminum with copper, silicon, manganese and bronze were explained along with compositions of brasses and bronzes.

Following the speakers a color-sound film, "Steel for the Ages," was presented through the courtesy of Allegheny Ludlum Steel Co. This picture showed the exacting science of producing stainless steel bars, sheets, wire and tubing.

Starting with the 2500-v furnaces which heat metals to 3000 deg F, the action progressed through pouring of 1200-lb ingots, along several miles of automatic rolling mills, strip mills and pack mills, then through pickling, cold rolling, annealing, polishing, inspecting and storing. One spectacular sequence featured "looping" of red-hot wire.

Visitors from Other States

Chairman William Hadfield presided over the preceding dinner hour and business meeting. The members elected a nominating committee composed of Past Chairmen Alan Stubbs and Kenneth Aiken of Bryant Chucking Grinder Co., and William Farrell of Cone Automatic Machine Co.

Out-of-town guests included: C. V. Topliffe, New England district manager from the Boston office of Cutler-Hammer, Inc.; Harold C. Cole and John Barker from the Hartford, Conn., office of Latrobe Electric Steel Co.; Arthur Thibault, superintendent, and J. R. MacDonald, production manager, Kiel Lock Co., Charlestown, N. H.

Industry Groups Compile New Hydraulic Standards

Rockford, Ill.—Approximately 1500 members and guests attending Rockford chapter's Past Chairmen Nite, January 6, in the Woodward Governor Co. auditorium heard James Robinson, chief engineer, Vickers, Inc., discuss the new hydraulic standards for industrial equipment as compiled by the Joint Industry Conference. Mr. Robinson heads the Committee on Hydraulics of the National Machine Tool Builders' Association.

Initial work on the standards, said Mr. Robinson, was undertaken by General Motors Corp. as an attempt to clarify standards for machine tools and other production machines with hydraulic actuation and control.

Identical interests were expressed by other automotive manufacturers and they were invited to sit in on these discussions. Representatives of the Automotive Joint Industry Conference, Hydraulic Equipment Manufacturers, Hydraulic Press Manufacturers, National Machine Tool Builders' Association, Resistance Welder Manufacturers Association, and the Tubing and Fitting Manufacturers were consulted. After 15 months of deliberation and discussion, the standards or "J.I.C." took shape.

Some Flexibility Permitted

The standards are general in nature and an effort has been made to keep specifications on a recommended engineering basis. Some sections are intended only as guides. Any deviation will be as agreed between supplier and purchaser.

In a breakdown by sections, Mr. Robinson listed: (HO) introduction and purposes of the standards; (H1) diagrams, with suggested symbols; (H2) hydraulic controls and control circuits; (H3) pumps; (H4) piping, fittings, and fluid passages; (H5) oil reservoirs and heat exchangers; (H6) valves, accessories, and devices; (H7) safety.

They tend to emphasize safety of personnel, to maintain uninterrupted machine production and extend machine tool life from a hydraulic standpoint. Many, he observed, aim for ease of service and repair.

Bengt Granberg, chief engineer, Sundstrand Machine Tool Co. and also a member of the NMTBA Committee on Hydraulics, introduced Mr. Robinson.

The meeting was sponsored by former chapter chairmen: E. W. Dickett, G. C. Johnson, K. W. Lund, H. F. Ruehl, F. J. Kampmeier, L. W. Reuland, F. R. Swanson, W. R. Lustig, D. E. Hawkinson, and E. Y. Seborg, chairman-in-charge.

Ladies Entertained

South Bend, Ind.—About 150 South Bend members and their women guests attended the chapter's annual ladies night dinner, held January 10 at the Mayfair Restaurant, Mishawaka.

During and after dinner the Aloha Islanders provided music. The "Great Leroy" entertained with magic and ventriloquism.

Sponsors of Rockford chapter's recent Past Chairmen's Night were, from left: E. W. Dickett, G. C. Johnson, K. W. Lund, H. F. Ruehl, F. S. Kampmeier, L. W. Reuland, F. R. Swanson and W. R. Lustig; also D. E. Hawkinson and E. Y. Seborg (missed by photographer)

Research in Springs Aims At 10 Million Deflections

St. Catharines, Ont. — Commercial hardware springs are designed to withstand 50,000 deflections, but experiments are in progress to produce specialized springs resisting 10 million deflections at high temperatures, L. C. Elder, chief engineer of the Wallace Barnes Co., Hamilton, told Niagara District chapter at a dinner meeting, February 3, in Hotel Queensway.

When selecting spring materials, there are eight main factors to consider, said Mr. Elder. In order of importance they are: cost, availability, tensile strength, modulus of elasticity, resistance—to fatigue, corrosion, heat, and conductivity.

Emphasizing importance of the resistance to heat factor, he cited the increased compression ratios being attempted in automobile engines as producing engine heat sometimes beyond the range of present valve springs. This prevents improvement of efficiency in the ordinary car motor. Tests now being made with new spring materials aim at 10 million deflections under a temperature of 350 deg F.

Shot peening the speaker described as a cheap and artificial method of putting the material in initial compression, in effect increasing the tensile range.

Past Chairmen Chosen As Nominating Committee

Pittsburgh, Pa.—D. L. Bardes, William Owen and Paul H. Magnus, all former chairmen of Pittsburgh chapter, were elected to serve as a nominating committee at a chapter meeting, January 7, in Fort Pitt Hotel.

Chairman Walter Risser reported on progress of arrangements for the Society's Annual Meeting in Pittsburgh this month. There will be no chapter meeting in March. Installation of chapter officers will take place during the convention.

Mr. Risser also announced that ASTE building fund participation certificates are available to members, and introduced new members and guests.

First Vice-Chairman Frank T. Boyd presented T. J. Donovan of the Donovan Co., Philadelphia, and national director of ASTE. The latter conducted his well-known "Silver Dollar Quiz."

Seventy members and guests attended the dinner meeting.

Zinc and Aluminum Alloys Gain in Die Castings

Springfield, Mass.—There is a definite trend toward more die castings of zinc and aluminum alloys, and to a lesser degree of magnesium and brass alloys, according to Fred J. Tobias of Hampden Brass & Aluminum Co.

Mr. Tobias stressed this in a talk, "Die Casting Now and in the Future," given before 80 members and guests attending a recent dinner meeting of Springfield chapter at the Hofbrauhaus, West Springfield.

He discussed steels for dies to cast alloys and preheat-treated steels for zinc base die casting alloys. The latter eliminate heat treating and cleaning after the impression is finished.

Along with the heavy increase in aluminum alloy castings and the development of magnesium and brass, the speaker mentioned new alloys with high zinc and copper content. Now in the experimental stage, these show promising physical properties, with a melting point of about 1500 deg F.

Processing equipment described included the cold chamber machine. Among important die casting factors explained were gating and venting, influence of pressure, and metal temperature.

Mr. Tobias concluded his lecture with a description of an electric magnetic pump without moving parts. This eliminates hand ladling and converts the cold chamber machine from hand to automatic operation.

The talk was illustrated throughout with slides.

Silver Brazing Methods Shown in Samples, Films

Los Angeles, Calif.—January 13 meeting of Los Angeles chapter featured as technical speaker John B. Ross, consulting engineer for Handy & Harmon. His subject was "Silver Brazing and the Production Line."

Mr. Ross showed items produced by the silver soldering method, such as bathroom fixtures, refrigerators, swing spouts, bicycle frames, dentures, stainless steel kitchen ware, and soda fountain fixtures.

A new color-sound film, "Fundamentals of Silver Brazing," illustrated techniques just out of the experimental stage. The motion picture demonstrated how to prepare joints for soldering and the proper application of flux and solder.

Anton Peck, A. T. Rando and Paul Slater were elected a nominating committee to submit candidates for chapter officers.

G.M. Engineer Explains Torque Converter Design

Boston, Mass.—Two hundred members and guests attended the January 13 meeting of Boston chapter to hear Oliver K. Kelley, engineer in charge of transmission development for General Motors Corp., Detroit, lecture on the "Modern Torque Converter."

Also on the program was Edwin K. Cunliffe, representing General Motors' new plant at Framingham. Walter Boothe of Cummings Machine Co., Boston, was technical chairman, with Chapter Chairman William W. Young, presiding at the dinner and business meeting.

Mr. Kelley opened his talk with a comprehensive explanation of the theories and ideas involved in designing the torque converter transmission, continuing with a detailed description of actual designs, problems and tests involved.

Tested in Military Operations

This type of transmission, said Mr. Kelley, had its first workout during the war, in tanks and half-tracks operating in the Mediterranean area, without experiencing any mechanical difficulties. This is understandable since the torque converter type of transmission was first designed for New York buses, averaging a gear shift once every 11 seconds in full throttle.

Mr. Cunliffe spoke briefly on production troubles encountered in establishing and operating the Framingham plant. He promised the chapter an open house and plant tour in May.

Henry Richards, national director of ASTE, was introduced as the newly appointed assistant to the general superintendent of the General Electric River Works at West Lynn. He spoke briefly on the new Society headquarters building in Detroit.

Die Casting Combines Economy with Efficiency

Elmira, N. Y.—When design permits, die castings produce the best product at lowest cost, according to C. R. Maxon, Market Development Div., New Jersey Zinc Co., New York City. As featured speaker at the February 7 meeting of Elmira chapter, Mr. Maxon emphasized this in a lecture, "Zinc Alloy Die Casting."

Motion pictures supplementing his talk illustrated die casting techniques for products as varied as zippers and airplane parts. A discussion period brought out interesting comparisons such as savings effected by die casting Link Trainer parts, as against the cost of sand casting fewer than 1,000 parts.

Prior to the technical session the following officers were elected for 1949: P. G. Pecoraro, chairman; D. K. Smith, first vice-chairman; V. T. Mac Rorie, second vice-chairman; M. G. Kristensen, secretary; R. N. Paterson, treasurer; J. F. Deegan, delegate; and B. J. Seifried, alternate.

Golden Gate Presents 'Trade Secret' Program

San Francisco, Calif.—"Trade Secrets Night" was the theme of the January meeting of Golden Gate chapter, held at El Curtola Cafe on the 18th.

Four members spoke and presented slides, prints and samples of tools having special features for their particular operation. The speakers were: Carl S. Peterson, of Nordstrom Valve Co.; Louis Talamini, Schlage Lock Co.; David Gustafson, Grove Regulator Co.; and DeWitt M. Grimm, Marchant Calculating Machine Co.

The program gave the chapter an opportunity to see and hear what their fellow members are doing and how they are contributing to better production.

The audience was enthused about this program innovation and requested more presentations of this nature.

Preceding the speakers, the regular business of the chapter was dispatched. Chairman Ernest Holden opened the meeting and made an announcement concerning the availability of ASTE building fund participation certificates.

National Director Karl L. Bues, a former chapter chairman, distributed a brochure of candidates for directors, stressing the importance of serious consideration to the selection of national officials.

The chapter elected a nominating committee composed of Edward J. Raves, chairman, Harold Wolpman and Mr. Grimm.

A highlight of the meeting was the introduction of all past chairmen of the chapter.

Film Shows Steel Usage

Windsor, Ont.—Harold B. Chambers, chief service metallurgist, Atlas Steels, Ltd., addressed a well attended meeting of Windsor chapter, January 10, in Prince Edward Hotel. His subject was "Relation of Design to Selection of Tool Steel."

Mr. Chambers supplemented his lecture with a sound film depicting the making and application of tool steels.

R. T. Richards, David Barnett and D. M. Duncan were elected a nominating committee to present candidates for chapter officers.

Atlanta Inaugurates Get-Acquainted Program

Atlanta, Ga.—"Know Your Fellow Member" was the theme of a meeting of Atlanta chapter, held January 17 at Georgia Tech dining hall.

The program consisted of brief talks by four members. Each speaker told something of his company, his work in the organization, manufacturing methods and problems encountered.

Those participating were: Charles M. Jenkins, Westinghouse Electric Corp.; Charles D. Toney, Auto-Soler Co.; Matthew W. Kemp, The Do-All Co.; and William R. Smith, Southern Saw Works. Education Chairman James C. Cogburn, Jr., of Williams Bros. Corp., was moderator.

In the ensuing open discussion, members had an opportunity to ask questions about the several companies and their products.

The chapter plans to continue this type of meeting to acquaint the group with their fellow tool engineers and with local industry.

A nominating committee elected during the evening consists of George W. Brown, Mr. Smith and Mr. Cogburn.

* * *

At the previous meeting, held in the Atlantic Steel Co. Auditorium, J. B. Tiernan, Southern representative of the Lubriplate Co., addressed the group. His subject was "Lubrication as Applied to Machine Design."

Mr. Tiernan first described how lubricating film forms on a bearing surface, and how the rotating member of the bearing rides on this film to prevent metal-to-metal contact. Charts illustrated his explanation.

Properties of various types of lubricants and factors determining selection for a given application were stated. The machine designer, said Mr. Tiernan, should consult a lubrication engineer early in the design stage of a machine so that the equipment would permit use of the most appropriate lubricant.

All too often, he charged, this is overlooked so that frequently an improper lubricant must be used with loss of machine efficiency and service life.

At the conclusion of his lecture Mr. Tiernan answered questions.

Principal figures on the January program at Boston chapter were, from left: Oliver K. Kelley (technical speaker), engineer in charge of transmission development for General Motors Corp., Detroit; Walter Boothe of Cummings Machine Co., technical chairman for the evening, and Edwin K. Cunliffe of the General Motors Framingham plant

Electric Plant Sponsors Metal Joining Program

Springfield, Mass.—Westinghouse Electric Corp. was host to 188 members and guests of Springfield chapter at a dinner meeting and plant tour, January 10.

Following dinner in the plant cafeteria, the group adjourned to the auditorium for a technical session.

Principal speaker was A. K. Phillippi, manufacturing engineer at Westinghouse, who gave an informative talk on all phases of metal joining. He showed slides and interesting samples of brazing. Another exhibit of die casting and lamination dies was a center of attraction.

After an extended question period, the party was conducted through the company's metal joining department.

Prior to the technical session I. F. Holland, Society president, spoke briefly on national affairs of the organization and V. H. Ericson, third vice-president, described the new ASTE building in Detroit and appealed for greater activity in increasing membership.

Ray H. Morris, building finance chairman, explained financing arrangements for the new headquarters, which permit members to invest in 4½ percent interest certificates. He urged participation by all members.

Balloting for a nominating committee resulted in the election of Michael Brennan, chairman, Kenneth Abbe, Alexander Todd, Charles Stonerod and Owen Stevens.

George Brown, chapter chairman, presided and Edward Stone, a former chairman, was master of ceremonies. C. B. Dick, Westinghouse works manager, welcomed the tool engineers on behalf of the management.

Speakers table guests also included: H. J. Burgess, manager, works planning, and J. C. Smith, manager, manufacturing division, at Westinghouse.

Houston Engineers To Hold Symposium

Houston, Texas — The Engineers' Council of Houston will hold its Second Annual Symposium, April 2, at the Rice Hotel. The Council embraces leading technical societies in the area, including Houston chapter of ASTE.

Theme of the symposium is "Conservation of Our Natural Resources." Five papers will be presented by prominent authorities. They are: "Conservation of Water," by Paul Weaver, president, American Association of Petroleum Geologists; "Conservation of Soil," Dr. W. A. Albrecht, chairman, Department of Soils, University of Missouri.

"Conservation of Major Sources of Energy," Eugene Ayres, Gulf Research & Development Co., Pittsburgh, Pa.; "Conservation of Character of Man," Dr. S. L. Joekel, Austin Presbyterian Theological Seminary, Austin, Texas.

Final address, "Conservation of Man," will be given at the banquet by Novelist Louis Bromfield of Lucas, Ohio.

Dean F. Saurenman, Baker Oil Tools, Inc., P. O. Box 3048, Houston 1, Texas, is taking reservations for the meeting.

Westinghouse executives explain exhibit to Society officers visiting Springfield (Mass.) chapter meeting at electric plant. From left: H. J. Burgess, works planning manager; H. Sebolt, assistant toolroom superintendent; J. C. Smith, manager, manufacturing division; I. F. Holland, ASTE president of Hartford, Conn.; C. B. Dick, works manager; R. H. Morris, former ASTE president of Hartford; and V. H. Ericson, national treasurer, from Worcester

Hard-to-Machine Parts Can Be Precision Cast

Kansas City, Mo.—George Fraser, manager, Rexalloy Div., Atha Works of Crucible Steel Company of America at Harrison, N. J., discussed "Specialty Castings and Their Application to Industry" at the February 2 meeting held at the Advertising and Sales Executives Club.

Mr. Fraser believes that most items easily machined on automatics are not economical for precision casting.

When a part is to be cast, the manufacturer sends a print to his steel supplier to be marked up with allowances for shrinkage. The print is returned to the customer, who makes the pattern. From this a master wax mold is formed, the wax being injected under pressure and controlled temperature.

The wax pattern is dipped in silicate, coated with sand, has wax gates and runners attached. To make the mold a plaster-like material is poured around the pattern. The mold is allowed to set up, then heated upside down so the wax can melt and flow out. By raising the temperature, the remaining moisture is dried out and the mold preheated for pouring.

Next the mold is attached to the top of a furnace with the gate down. The furnace is turned upside down; metal flows into the mold, and weight of the extra metal in the furnace provides pressure to fill the mold. Castings weighing up to five pounds are made by this process.

Castings of this type, Mr. Fraser pointed out, have slightly lower impact strength and slightly larger grain size than similar parts made from bar stock.

A display of castings and comparable machined parts was shown and an open discussion conducted by the speaker.

Preceding the technical session, officers were elected. The members chose Samuel Waas, chairman; Ray Skates, first vice-chairman; John Needham, second vice-chairman; Warren Ricketson, secretary; and Ivan Nelson, treasurer.

Wangelin, New Chairman

Moline, Ill.—Tri-Cities chapter elected 1949 officers and presented a program on "Diamonds and Their Place in Industry" at a dinner meeting February 2 at Rock Island Arsenal.

New executives voted in are: D. A. Wangelin, chairman, and J. L. Howe, first vice-chairman, of Rock Island; Joseph Zelnio, second vice-chairman, and K. E. Saunders, secretary, of Moline; R. T. Henning, treasurer, of Davenport, Iowa; and E. B. Benson, delegate, of Moline.

I. E. Rivkin, sales manager, Molina Diamond Co., New York City, was the speaker. He illustrated his talk with films showing the mining, cutting, processing and use of diamonds.

Sees Full Mechanization Through Machine Tools

Erie, Pa.—Guest speaker at the January 4 dinner meeting of Erie chapter was H. E. Linsley, associate editor, *American Machinist*. Mr. Linsley addressed an audience of 37 at General Electric Community Center, concerning "The Meaning of the Machine Tool."

In introducing the speaker, Chairman Vincent Peck outlined the development of machines, pointing out their influence on modern living. Every convenience from steam heat to television, he indicated, is a direct or indirect product of machine tools.

Rather than destroying jobs as sometimes alleged, Mr. Linsley emphasized, machine tools are the world's greatest creators of employment. Without them the vast industrial enterprise of today could not exist.

By an imaginary journey backwards in time, he showed how machine tools have established new industries. Through a similar trip into the future, he outlined the day of completely automatic factories where operations will be performed without human aid. But the necessity of high maintenance will create jobs for all, the speaker assured.

F. R. Crook Chosen Chairman at Toronto

Toronto, Ont.—An overflow attendance of 150 dinner guests, swelled by an additional 50 at the meeting and technical session, turned out for Toronto chapter's election night, February 2. The meeting was held in the Oak Room at the Union Station.

Following the report of the Nominating Committee, officers for 1949-50 were elected. They are: F. R. Crook, chairman; J. B. Burk, first vice-chairman; V. L. Davey, second vice-chairman; D. R. Cooper, third vice-chairman; K. R. Laidley, secretary; H. C. Upton, treasurer; J. R. Lengbridge, delegate; and Mr. Burk, alternate.

A. J. Baumgartner of Cincinnati Shaper Co. presented the technical subject, "The Press Brake in Sheet Metal and Plate Work." Excellent slide illustrations accompanied his talk.

A useful and versatile machine, the press brake, said Mr. Baumgartner, is more than a means of bending sheet metal. By using special tooling setups, he added, many plants are finding that they can run production jobs requiring numerous punched holes, on a press brake machine.

A lively question and answer period followed his talk.

Chairman John Lengbridge presided at the meeting and H. C. Upton introduced the speaker.

Approximately 30 guests were present from Fergus, Owen Sound, Belleville, Port Hope, Oshawa and Niagara Falls.

Faster Threading, Milling With New Automatics

Worcester, Mass.—Threading on automatic screw machines has been speeded up by a development in which die head and workpiece turn in the same direction, with the die head revolving much faster to overtake, advance, and cut the thread.

This and other advances in automatics and tooling applications were explained by Deming C. Cross, supervisor of sales engineering, Brown & Sharpe Mfg. Co., Providence, R. I., in an address, February 1, before approximately 100 Worcester members.

The high speed threading, together with efficient designing of other tools allowing all operations to overlap, has cut machining time to a new low, according to Mr. Cross.

Special attachments permit milling operations on the new screw machines, eliminating a costly second operation setup. Slides illustrated devices for making automatics more versatile. Carl D. Schofield, program chairman, introduced the speaker.

Ralph E. Rawlings, chapter chairman, announced that the floor would be open to a discussion to consider forming a carbide engineering chapter, after a technical question period.

Previous to the talk a slate of officers was submitted by Charles M. Monigle, nominating committee chairman.

Improved Tooling and Layout Ups Output 54 Percent

Philadelphia, Pa.—Over a period of four years changes in tooling and arrangement have increased output in a Philadelphia plant from 19,500,000 pounds to 30,000,000 pounds without loss of time in changeover.

Speaking before 245 tool engineers at a dinner meeting of Philadelphia chapter, January 20, R. B. Holmes, general manager, and D. H. Renfrew, general superintendent, of the local Link-Belt Co. plant, explained this accomplishment.

R. B. Holmes, general manager, Link-Belt Co. Philadelphia plant, acknowledges applause that followed his address on modern tooling before Philadelphia chapter

The changes and advanced tooling techniques employed were clarified in a new Link-Belt film, "Modern Tooling and Its Application to Industry." Use of layout templates to determine locating points for succeeding machining operations was emphasized.

Applications of hydraulic clamping and holding work, indexing and positioning were shown, as were examples of efficient carbide milling, boring, turning and facing.

Details of an oscillating cam-controlled milling fixture to cut teeth on a convex surface were brought out by slow motion showing cutter and index cycles, plus cutter relief mechanisms for clearing work on return stroke. Shots of final inspection, heat treating, progressive assembly of units and a display of finished products concluded the motion picture.

A twenty-minute open discussion followed, with A. B. Luecke and E. A. Lund answering questions from the floor. These men and Second Vice-Chairman Roy Paulsen, all members of the chapter executive board, designed the tooling described. Mr. Paulsen arranged the technical program and introduced the speakers.

Clarence Duffany, Byron Gates, Walter Czarnecki, George Baker and Edward Glenn were elected a nominating committee to select officer candidates.

Harry Smithgall, standards co-chairman, explained standards committee work and asked for volunteers to aid in the committee's program.

First Vice-Chairman Emil Kitzman presided in the absence of Chairman Samuel Boyer, who was convalescing from a virus infection. Mr. Kitzman announced the resignation of George A. Daum, industrial relations chairman and assistant secretary, who has a new position in another state.

Past chairman H. W. Gross offered the invocation before dinner.

* * *

More than 320 members and guests attended a gala Christmas party at the Engineers Club.

Festivities began with a socal hour and group singing. Second Vice-Chairman Paulsen attired as Santa Claus added to the merriment. An accordionist furnished music.

After dinner, gifts were presented to Engineers Club employees and door prizes were awarded. A two-hour program of professional entertainment was followed by the singing of Auld Lang Syne, and presentation of gifts to the entertainers by T. J. Donovan, Jr., national director.

Names Considerations For Correct Milling

Kansas City, Mo.—Users and operators should consider five points essential to good milling: selection and design of proper cutting tools, suitable cutting fluid, adequate power, required feeds and speeds, and rigidity of machine and fixtures.

This was stressed by A. O. Schmidt, research engineer, Kearney & Trecker Corp., Milwaukee, Wis., in a slide-illustrated discussion, "Principles and Practice with Modern Milling Machines," during a meeting of Kansas City chapter, January 5, at the Advertising and Sales Executives Club.

Primary considerations from the machine tool builder's standpoint, said Mr. Schmidt, are selection of material for the machine, installation of power controls, and ease of operation and maintenance.

Relating an experiment to evaluate carbide tools, Mr. Schmidt described how he had set up a drilling operation on a dynameter within a calorimeter. Power required was determined by amount of heat dissipated.

In subsequent tests using the colorimetric principle, tools were studied at various feeds, speeds and rake angles. At 100 sfpm, 70 percent of the heat went into chips, 15 percent into tool tip and 15 percent into the workpiece. As speeds and feeds were stepped up, temperature of chips and work increased only slightly. With higher tool heat, tool life dropped off.

Surface finish, he feels, is directly dependent on speeds and feeds. Uniformity of color and chip curl indicate degree of tool wear. His tests showed also that the most economical point to regrind a tool is when 1/32 in. is worn at the periphery.

In discussing coolants, the speaker stated that price is no criterion for evaluating a cutting fluid. He favors water over other cooling mediums, but does not recommend it for milling and fly cutting.

Mr. Schmidt answered questions from an audience of 55 members and guests.

Calls Electronic Tube Six Function Switch

Montreal, Que.—A departure from the usual mechanical subjects featured the January 13 meeting of Montreal chapter in Canadian Legion Hall, when W. Gordon Clarkson of Canadian Westinghouse Co. spoke on "Electronics at Work."

With slides, Mr. Clarkson first outlined basic principles of the science of electronics, describing the structure of the atom as consisting of electrons, protons and neutrons. He showed also how electric currents are generated by releasing electrons from matter and controlling their flow with electronic tubes.

Three Methods Used

"There are three ways to release electrons from a body," stated Mr. Clarkson, illustrating how this is accomplished by thermionic emission, or application of heat. Photo-electric emission as exemplified by the electric eye, and high-field emission in which electrons are forced out by cold cathode tubes, are the other two methods.

An electronic tube is merely a switch, he asserted, but went on to point out that it performs six functions which are impossible for an ordinary switch. These tubes can rectify, amplify and generate current. They control power flow, transform light into current and current into light.

In an interesting demonstration, he showed how light shining on a phototube actuates a whole relay through the use of electronic tubes. The speaker then demonstrated how thyratron, or mercury vapor, tubes can regulate and control the flow of current.

Electronic control has made modern resistance welding possible, he continued, and showed with an oscillograph how current can be controlled by electronic tubes, down to a half cycle.

A modern picture, "Electronics at Work," depicted industrial applications where electronic control has become indispensable. Audience interest in the subject was evident in a lengthy discussion period which followed the lecture.

G. A. Rogers introduced the speaker and G. S. Clarke thanked him.

Stanley Wallace, field service manager of Colonial Tool Co., Ltd., in Windsor and a member of the ASTE chapter there, was a guest.

Nearly 300 Dine, Dance At Annual Holiday Party

St. Louis, Mo.—Approximately 288 St. Louis members and their ladies participated in the chapter's annual Christmas party, held December 17 in the festively decorated ballroom of the Sheraton Hotel.

After dinner the company enjoyed dancing, and chatting in little groups. Highlight of the affair was a visit from Santa, who delighted the ladies with attractive gifts.

Entertainment Chairman Emil Stempfel and his committee had charge of the pleasant social function.

Rochester T.E.'s Meet With Management Group

Rochester, N. Y.—More than 400 members and guests of the Rochester ASTE chapter and the Superintendents and Production Managers Group of the Industrial Management Council attended a joint dinner meeting, January 3, at Rochester Chamber of Commerce.

Speaker of the evening was Dr. Leo Wolman, professor of economics at Columbia University. In his address, "Inflation and the Labor Problem," he scored labor policies. Many, he said, are old and tend to depreciate currency. Inflation he defined as an unstable situation that never reappears in the same form.

The cycle of war, high wages, scarce goods and black markets swells the bubble. Meanwhile manufacturers are spending money to produce quicker and cheaper, with fewer employees and greater profits. As demand for goods is satisfied, orders drop off and business slackens.

Top: Dr. Leo Wolman, professor of economics at Columbia University, chats with H. O. Simon, Rochester chapter chairman, and George Eyer of the Rochester Industrial Management Council at joint meeting of the two organizations. Dr. Wolman was principal speaker for the occasion. Below: Roderick G. Newell (left) a cooperative student at Rochester Institute of Technolgy, receives chapter scholarship of $100 from W. R. Gordon, first vice-chairman of the ASTE group

Dr. Wolman cited labor, the major cost of doing business, as receiving about 66 percent of the national income. With the farmer included, this figure rises to 82 percent.

John C. Dense, chairman of the Industrial Management Council and a former chairman of the local ASTE chapter, welcomed the latter group and introduced H. O. Simon, incumbent chairman.

Mr. Simon introduced W. R. Gordon, first vice-chairman, who presented the chapter's annual scholarship award to Roderick G. Newell. A cooperative student at Rochester Institute of Technology and Eastman Kodak Co., Mr. Newell won the $100 prize for being the outstanding pupil in his group.

Have you subscribed for your ASTE Building Fund Certificates?

McFair Heads Madison, Other Officers Named

Madison, Wis.—Vern McFair, supervisor of methods and tooling, Ohio Chemical & Mfg. Co., was elected chairman of Madison chapter at a meeting held February 8 at the Playdium.

Also chosen to serve with Mr. McFair are: W. R. Carnes, president, W. R. Carnes Co., first vice-chairman; J. L. Piekarski, chief draftsman, Parker Pen Co., second vice-chairman; George Morris, sales engineer, Gisholt Machine Co., third vice-chairman; W. W. Schaerff, production scheduling supervisor, Ohio Chemical & Mfg. Co., secretary; Hans H. Heydn, machine shop superintendent, Celon Co., treasurer; L. A. Leifer, assistant chief engineer, Gisholt Machine Co., delegate; and Gordon Lampe, president, Gordon Engineering, Inc., alternate.

S. E. Beer, special sales representative, Monarch Machine Tool Co., discussed advances in special turning operations.

Turns Graduated Diameters

By means of a template or master piece, an air tracer lathe automatically turns any number of progressively larger diameters. The tool slide is set at 45 deg to permit square shoulders as the tool steps from one diameter to another. These operations can be held within an accuracy of about 0.002 in.

An air tracer operates a hydraulic mechanism that guides the tool. Advantage of this lathe is the elimination of multiple tool setups. Setup time is about ten minutes as against two hours for complicated setups. Since only one tool is cutting at a time, less horsepower is needed. With this machine, said Mr. Beer, a job can often be done in a fraction of the time required by conventional means.

A high precision tool room lathe demonstrated accuracies within 0.0002 in. By merely turning an adjusting wheel, cutting speed may be increased from the slowest to the fastest set or any point between. Bringing up to speed and stopping is done within a couple of seconds.

Follows Irregular Contours

Continuing, the speaker showed possibilities of turning on surfaces which are not round, particularly useful in making molds for bottles and glassware. In this case the tool is fed in and out from a master revolving in synchronism with the piece being turned.

To further shorten operations, this principle of irregular turning can be combined with the Keller principle for facing, where another tracer follows a master and feeds the tool axially to develop the surface desired on the face.

In conclusion Mr. Beer pointed out that high labor costs and increasing competition necessitate more semi-automatic and automatic machinery. Films illustrated all phases of his talk.

R. A. Bertsch, district manager, and R. K. Hewitt, sales engineer, of the Monarch Co., accompanied Mr. Beer.

Sixty members and guests were present for the election and technical session.

Urges Better Measuring Methods to Cut Waste

Toronto, Ont.—"Precision Machining and Electronic Measuring" was described in detail by James Meehan, in charge of grinding machine sales for Brown & Sharpe Mfg. Co., at the January 5 meeting of Toronto chapter.

After reviewing advances of the past few years, Mr. Meehan demonstrated with slides accomplishments in faster, more precise grinding, and in operator ability to measure work with assurance and ease.

A machine designed and built to work to exacting tolerances, he emphasized, is of little use unless there is provision for a method of positive measurement. Micrometers, he stated, still have their place as valuable measuring tools; but in splitting tenths, an easy, more accurate method of measuring is desirable.

Automatic cycle, spark timing, wheel truing and the use and abuse of coolants were all explained. Not confined to plunge cut grinding, the automatic cycle, he stressed, can be used with reciprocating table, employing normal sparking-out time. The automatic cycle can be quickly disengaged, leaving the standard machine for short run lots.

Cannot Deviate from Parallel

Unless work can be kept absolutely parallel, it is futile to attempt to work to tenths, said Mr. Meehan. Any slight deviation from parallel and the tolerance is lost by grinding a corresponding taper. This problem can be solved, he indicated, by using an instrument called the Electralign, to keep the table dead parallel. The device may also be used to set a machine for taper grinding, saving considerable time over conventional methods.

Spoiled work, often blamed on the operator, is actually the fault of inadequate measuring methods, he stated. Comparators are commonly used in inspection departments and it is there the inability of operators is revealed. But, if an operator is working to 0.0001 in. tolerance, he can scarcely be blamed for carelessness, the speaker added.

With the Electralign comparator selector he has the same means of measuring as the inspector who will check his work. This reduces scrap and speeds all production operations.

The question and answer period brought on a lively discussion. Samples of precision ground parts and a variety of measuring instruments were displayed.

Chairman John Lengbridge presided over a capacity audience.

Chicago Fetes Ladies

Chicago, Ill.—Approximately 150 tool engineers and their women guests enjoyed a dinner dance held recently at the Shoreland Hotel.

An excellent floor show was followed by an evening of dancing to Sherman's orchestra. The program included several dance numbers in which the entire group participated.

Each lady received a spun aluminum bowl as a gift of the chapter.

Aided Allies in Escape From Prison Camps

Elmira, N. Y.—Elmira chapter, ASTE, and Elmira Area Industrial Engineering Council met jointly January 10 at Mark Twain Hotel, with about 70 members of the two organizations present.

Captain James N. Coletta spoke on International Service No. 9, "Retrieving," relating thrilling experiences in aiding allied soldiers and airmen to escape from German camps during World War II.

Captain Coletta substituted for the scheduled speaker, J. L. Schwab, New England division manager, Methods Engineering Council, who was delayed by bad weather at New York.

A nominating committee was elected to present a slate of officers at the next meeting. Members of the committee are: Floyd Allen, chairman, Ross Williams and Ray Rauscher.

Chairman James F. Deegan presided and First Vice-Chairman Patrick Pecoraro introduced the speaker.

Enjoying themselves at Golden Gate's Christmas stag are, from left: Ernest Holden, chapter chairman, I. S. Minetti, entertainment chairman, and Edward Raves, past chairman, part of committee in charge of the event

450 Crowd Annual Stag

San Francisco, Calif.—Golden Gate chapter held their annual Christmas stag party, December 16, at Club Alabam in San Leandro. Four hundred and fifty members and guests filled the club to capacity.

Dinner was followed by a variety show. The professional entertainment, as well as some extemporaneous acts put on by members, was thoroughly enjoyed by the merrymakers.

Officers responsible for the successful affair included I. S. Minetti, entertainment chairman; Ernest Holden, chapter chairman; Edward Raves, past chairman; and James Coulter, Secretary.

Fairfield County Elects Wilterdink Chairman

Bridgeport, Conn.—Fairfield County Chapter held its annual election February 2 at Stratfield Hotel. Officers chosen are: chairman, Meredith W. Wilterdink; first vice-chairman, Thomas E. Hogan; second vice-chairman, Douglas F. Linsley; treasurer, Thomas J. Keating; and secretary, Mason B. Whiting.

As the technical feature, J. C. Fox, chief metallurgist of Doehler-Jarvis Corp., spoke on "Die Casting, Its Processes, Equipment and Technology." Mr. Fox gave an informative talk well illustrated with samples and a sound film.

Doyen Tells Advantages Of Tool and Die Welding

St. Louis, Mo.—Traditionally St. Louis chapter earmarks its January meeting for a joint technical session with the St. Louis Engineers Club and another engineering society.

This year the Tool Engineers and St. Louis chapter of the American Welding Society were guests of the Engineers Club, January 6.

After dinner and a business meeting at the Camille Tea Room, the ASTE group adjourned to the Engineers Club for the technical program.

Bryce Smith, chairman of the host group, opened the meeting and greeted the assembly of more than 350 engineers. H. M. Creasey, ASTE chairman, was introduced and turned the meeting over to W. G. Callies, first vice-chairman.

Mr. Callies presented the principal speaker, Patrick S. Doyen, field engineer, Welding and Supply Co.

Demonstrates with Films

Prefacing his talk with two films on tool and die welding, Mr. Doyen showed methods for repairing dies and welding procedures using tool steel electrodes.

Tool steel welding, he explained, is a specialized phase of welding increasingly important to the metal working industry. It is the deposition of basic types of tool steels by the metallic-arc, atomic-hydrogen or oxyacetylene processes.

To facilitate machining, the speaker pointed out, weld deposits of tool steel electrodes can be annealed and afterwards heat treated and tempered. Tool steel welding should not be confused with hard facing. Materials for this process usually do not lend themselves to heat treatment.

Any plant using tools and dies will find tool steel welding profitable, according to the speaker. It saves time and material as it can be applied by the metallic-arc method to practically all types of tool steels. Die units for blanking, forming, forging, hot or cold trimming can be salvaged or reclaimed.

Cautions About Heating

In discussing salvage methods, Mr. Doyen observed that for tool and die welding the electrode need not be exactly the same steel as the part being welded. But in most cases the welding electrode should match the heat treatment in base metal classification as closely as possible.

Preheating before welding is important—never below the minimum, nor beyond the maximum of the "draw range" temperature for welding. If the unit is preheated above the draw range, hardness will be lost through disturbing the original structure of the steel. Maintaining proper preheat temperature during welding preserves steel hardness.

Annealing, normalizing, hardening and tempering, temperatures and processes for tool steel welding were included in the discussion.

At the close of the meeting refreshments were served.

Left: Matthew Hetzel, Edwin Gustafson and Harold Hagle, Erie chapter nominating committee, count votes in election of chapter officers. Right: G. H. Stimson (technical speaker) of Greenfield Tap & Die Corp. and Vincent A. Peck, retiring chairman of the chapter

New Administration Elected at Erie

Erie, Pa.—Erie members elected officers for the 1949-50 term at the annual meeting of the chapter, held February 1 at General Electric Community Center.

A. E. Weingard is the new chairman. Elected to serve with him are: S. S. Sadoski, first vice-chairman; J. H. Van Kampen, second vice-chairman; E. A. Norgren, secretary; and J. T. Halmi, treasurer.

V. A. Peck, retiring chairman, was named delegate and Mr. Weingard, alternate. Representatives to the Erie Engineering Council are M. H. Hetzel and H. W. Hagle.

Technical feature was an address by G. H. Stimson, sales manager and chief engineer, Gage Div., Greenfield Tap and Die Corp. Mr. Stimson's talk, "Screw Threads and Tap Design," was illustrated by slides emphasizing the necessity of accurate tap and die work and close tolerances between internal and external threads, to produce good gages and increase production. He also discussed a forthcoming standard for dry seal pipe thread.

Fifty-one members and guests attended the meeting and smorgasbord dinner which preceded it.

Chairman Peck presided at the meeting.

Phillips Named Chairman At Fox River Valley

St. Charles, Ill.—B. J. Phillips was elected chairman of Fox River Valley chapter at the annual meeting held February 1 at the Milk Pail, north of Elgin.

Other officers chosen are C. H. Alltop, first vice-chairman; George Bodi, second vice-chairman; C. A. Olson, secretary; and George Parsons, treasurer.

R. F. Waindle, retiring chairman, was elected delegate, and Mr. Phillips, alternate.

F. B. Fuller of Brown Instrument Co. Div., Minneapolis-Honeywell Regulator Co., showed two films prepared for his company by Walt Disney, for training technical men in the armed forces. The motion pictures, "Basic Electricity" and "Basic Electronics," are used at Brown Instrument training school.

Says Carbides Influenced Fortunes of World War II

New York City—If Germany had not developed hard cemented carbides, World War II would have been delayed two years; if the United States had not developed carbides, it would have taken two more years to start materiel production and we could not have defeated Germany, according to Gregory J. Comstock, professor of powder metallurgy, Stevens Institute of Technology.

Mr. Comstock made this point during an address before Greater New York chapter, January 3.

In a visit to Germany after V.E. Day, the speaker learned that the Germans had organized a hard cemented carbon authority, who standardized cemented tungsten carbide tools to only 35 tool tips covering all jobs.

Mr. Comstock reviewed the history and development of carbides, stressed their importance in peace and war and their significance in possible future emergencies. His lecture included a general picture of carbide production.

Philip M. McKenna, president of Kennametal, Inc., and inventor of crystallized carbides, continued the technical presentation. He showed charts of cemented carbides, giving the modulus of elasticity, transverse rupture test and hardness test.

The K138 metal, which is 80 percent tungsten carbide and 20 percent cobalt, can be heated to 2000 deg F. for prolonged periods with little oxidation. Having about 50,000 psi tensile strength at 1850 deg F., it is suitable for gas turbine applications.

Evolution of carbide tools from the first standard brazed tips to modern clamped tool bits was shown in slides.

Urges Labor, Management To Be More Altruistic

Pontiac, Mich.—January dinner meeting of Pontiac chapter was held on the 20th at Henry's.

Samuel Hill, supervisor of labor relations for General Motors Truck and Coach Div., spoke briefly on labor relations at his plant and conducted a question and answer period.

Management and labor, he feels, should make greater efforts to understand each other and to work hand in hand for the benefit of the individual. They should strive, too, for the betterment of both groups, instead of taking a selfish attitude toward each other.

Rubber Plant Host For Tour, Lecture

Poughkeepsie, N. Y.—"De Laval Night" was the theme of the January 11 meeting of Mid-Hudson chapter. Attended by 125 members and guests, it was the first of a series of annual meetings featuring area industries.

Prior to dinner at the Nelson House, the group assembled at the plant of De Laval Separator Co., manufacturers of cream separators, milking machines and industrial centrifugals. Here they were shown through a modern rubber plant—laboratory and compound room, mixing and breakdown mills, calenders, tubing machines, molding presses and power plant.

Following dinner and a short business session, Chairman Llewellyn H. Tenney turned the meeting over to E. Gray Merrill, company works manager and vice-president in charge of manufacturing. Mr. Merrill related the history of the rubber department and commented upon the importance of the tool engineer to industry.

He introduced G. Russell Lozier, assistant superintendent in charge of rubber and foundries, as technical speaker. Mr. Lozier opened his talk, "Engineering Properties of Rubber," by tracing the discovery and development of rubber. This substance the speaker defined as a transition state between liquid and solid.

Difficult to Engineer

It differs chiefly from other engineering materials in the severe strains to which it can be subjected without rupture. In utilizing this capacity the engineer finds that the usual engineering calculations fail and that material properties of rubber cannot be easily or directly measured under conditions of considerable strain.

Likewise, the rubber technologist finds it difficult to supply usable information concerning fundamental physical properties of rubber-like materials. The best present solution of a rubber engineering problem is based largely on experience, trial and error rather than on mathematical design. Viewpoints of both engineer and rubber technologist should be considered.

When a satisfactory composition has been found, Mr. Lozier stated, attempts are made to characterize it by standard rubber tests. Some tests may bear little or no relation to desired performance, but do serve as a manufacturing control.

The engineer can contribute primarily through accurate specification of requirements, the speaker emphasized in closing.

Walter A. Scott, superintendent and chief engineer of De Laval, described his recent flight to Sweden.

During the business session, John L. Petz, Ornendo Freer and Walter Stadtler were elected a committee to nominate officers.

New members introduced are: Frank Plotnik, William Olah, Louis Sernate, Ludwig Schilling, John Smithers, James Marchese, Jack Schaffer and Jules Stern.

Coming MEETINGS

ALL CHAPTERS—March. Installation of officers.

BOSTON—April 14. Subject: "Die Design for Inclinable Presses."

CENTRAL PENNSYLVANIA — March 17. Speaker: R. R. Rhodehamel, National Acme Co., Cleveland, Ohio. Subject: "Tooling Multiple Spindle Automatics and How." April 21. Speaker: P. M. McKenna, Kennametal, Inc., Latrobe, Pa. Subject: "Principles of Design for Cemented Carbide Tools and Appliances."

CLEVELAND—March 11. Speaker: J. I. Karash, process engineer, Reliance Electric & Engineering Co. Subject: "Design of Dies for Inclinable Punch Presses." April 8. Speaker: N. E. Rothenthaler, superintendent of production and planning, steel operations, Ford Motor Co., Dearborn, Mich. Subject: "Metallurgical Control of Deep Drawn Stampings from Cold Rolled Steel." Coffee speaker: Col. H. W. Miller, Ordnance Dept., U. S. Army, University of Michigan, Ann Arbor, Mich. Subject: "War with Russia."

DAYTON—March 14, 6:30 p.m. at Suttmillers. Speaker: Willis DeBoer, plant manager, Engineers Specialties Div., Universal Engraving & Colorplate Co., Buffalo, N. Y. Subject: "Inspection by Optical Projection." April 11, 6:30 p.m. Plant tour, Kuhns Bros. Foundry. Subject: "Modern Methods in Cast Iron and Alloy Fittings."

DENVER—April 8, 6:30 p.m., Oxford Hotel. Speaker: R. R. Rhodehamel, National Acme Co., Cleveland, Ohio. Subject: "Automatic Screw Machines."

DETROIT—April 14. Plant tour through Detroit Edison Channel Plant.

ERIE—April 5, 7:15 p.m., dinner at Carver Hotel. Plant tour, Sylvania Electric Products, Inc., Warren, Pa.

KANSAS CITY—April 6, 8 p.m., Bradley Chemistry Laboratory, University of Kansas, Lawrence, Kan. Speaker: Dr. A. W. Davidson, professor of chemistry, University of Kansas. Subject: Lecture and demonstration of liquid air.

MADISON—April 5, 6:30 p.m. Speaker: W. J. Meinhardt, president, Meinhardt Diamond Tool Co., Chicago, Ill. Subject: "Romance of Diamonds."

NEW HAVEN—April 14, 8:00 p.m., Dunham Laboratory, Yale University. Speaker: Joseph Benson, Eastern Machine Screw Corp. Subject: "Screw Machines."

NEW YORK, GREATER—April 4. Speaker: E. V. Crane, vice-president, Sam Tour & Co., Inc., New York. Subject: "Metal Working Principles Underlying Punch and Die Design."

NIAGARA DISTRICT—April 7, St. Catharines. Speaker: J. W. Lengbridge, Aluminum Goods, Ltd., Toronto. Subject: "Spinning."

PEORIA—April 5, 6:30 p.m., Jefferson Hotel. Annual Family Night. Speaker: Prof. Russell Oakes, inventor. Subject: "An Inventor's Approach to Everyday Problems."

PHILADELPHIA — March 17. Subject: "Broaching Symposium." April 21. Subject: "Quality Control."

PONTIAC—March. Dinner meeting for members and wives. Speaker: Fred Falberg, Jr., factory mgr., General Motors Truck & Coach Div. Subject: "Cat Fishing on the Mississippi."

RACINE—April 4, 6:30 p.m., Manufactures Assoc. Bldg. Speaker: P. M. McKenna, president, Kennametal, Inc., Latrobe, Pa. Subject: "Kennametal Products."

TORONTO—April 6. Subject: "Meehanite," presented by E. Long, Ltd., Orillia.

TRI-CITIES—April 6, 6:30 p.m., French & Hecht, Div. of Kelsey-Hayes Wheel Co. Plant tour.

TWIN STATES—April 6, Windsor, Vt. Speaker: H. B. Clark. Subject: "Cast Alloy Precision Castings."

WINDSOR—March 14. Speaker: K. F. Tupper, director of engineering, Chalk River Project. April. Speaker: James Meehan, Brown & Sharpe Mfg. Co., Providence, R. I. Subject: "Precision Machining and Electronic Measuring."

Proves Quality Control With Sampling Machines

New Haven, Conn.—Model sampling machines, reproducing as nearly as possible actual machine conditions, were used by O. H. Somers, consultant on statistical quality control, to demonstrate the value of quality control during an address before New Haven chapter.

Mr. Somers was guest speaker at a meeting held January 13 in Dunham Laboratory of Yale University.

Using charts he described the principles of quality control. Through this scientific sampling method, Mr. Somers pointed out, production records can be improved and manufacturing costs lowered.

James H. Broderick, technical chairman, introduced the speaker and briefly discussed importance of quality control from management's viewpoint.

Reports on Hydraulics

Richmond, Ind.—"What's New in Hydraulics" was reported to Richmond chapter members by Allen Perry, manager, Cincinnati office of Vickers, Inc.

Mr. Perry was guest speaker at a meeting January 11 in the Richmond-Leland Hotel.

Color sound films illustrated his discussion of recent developments in oil hydraulics standardization.

Operators Ill-Informed On Tool, Die Welding

Syracuse, N. Y.—Most welded die failures can be traced to lack of knowledge on the part of the welder, according to Frank E. Kessler, field engineer for Welding Equipment & Supply Co., Detroit, Mich.

The operator should be educated in correct methods for welding tools and dies and in selecting electrodes, Mr. Kessler added, during a lecture before a meeting of Syracuse chapter, January 11, at Onondaga Hotel.

The electrode must not only have hardness similar to the tool steel, but must also be capable of the same heat treatment. After detailing methods of selecting electrodes and heat treating necessary for best results, the speaker stated that all types of metallic dies, regardless of material, can be welded successfully if care is used.

In closing he stressed correct welding temperature and heat treatment of the die before and after welding.

Abrasive Engineers Air Application Problems

Louisville, Ky.—Principal speaker at the January 12 dinner meeting of Louisville chapter was H. C. Beach, Cincinnati district manager of the Carborundum Co. Mr. Beach was assisted by Ward J. Martin, Cincinnati field engineer, and S. J. Sabick, Jr., Louisville sales engineer, for Carborundum.

They defined specific abrasive applications and troubles encountered during surveys of numerous industrial plants. Two motion pictures augmented their talks. One, "Romance of Carborundum," depicted the processing of abrasive wheels and demonstrations in plants using abrasives on wood, ceramics, glass and metals. The speakers assisted several members in finding solutions to problems.

During the evening a nominating committee was elected. Its members are Sauter F. Reichert, J. E. Paskey and Fred Brown.

Sixty-three members and guests attended the technical session at the Kentucky Hotel. Under the direction of Oscar Bromark, membership chairman, chapter membership has increased 32 percent during the year.

Obituary

George M. Ray

George M. Ray, 45, manager of the Windsor, Ont., branch, F. F. Barber Machinery Co., died suddenly, January 29, following a heart attack.

Before joining the Barber Company in 1944, Mr. Ray had been associated in sales and executive capacities with Canadian Fairbanks-Morse Co., J. T. Wing & Co., Ltd., John E. Livingston Machinery Co. and T. C. McDonald Machinery Co., Ltd., all of Windsor.

Mr. Ray was born at Milton, Ont., and educated in the Windsor schools. He was a charter member of Windsor chapter

North East West South IN INDUSTRY

Emil **Gairing**, president of Gairing Tool Co., Detroit, was elected president of the **Cutting Tool Manufacturer's Association** at its fifth annual membership meeting in Detroit. Vice president is Norman **Lawton**, Star Cutter Co. **R. S. Spencer**, Detroit Boring Bar Co., was elected treasurer, while **Harry J. Merrick** continues as executive secretary.

Emil Gairing

Louis C. Edgar, Jr.

Louis C. Edgar, Jr., has been elected president of **E. W. Bliss Co.**, Detroit, it has been announced. Mr. Edgar, who at 38 is the youngest Bliss president since Eliphalet W. Bliss founded the company 90 years ago, will make his headquarters at the Toledo works. Mr. Edgar comes to Bliss from the presidency of H. & B. American Machine Co.

Tool Equipment Co., Chicago, has been appointed representatives for the **Multi-Hydromatic Welding and Mfg. Co.** in the states of Illinois and Iowa.

Newman L. Smith has been elected president of the **Airquipment Co.**, Burbank, Cal., and its subsidiary, **Aerol Co., Inc. Jack Newburn**, superintendent of Lockheed's Constellation division, was elected a vice president of the company.

C. R. Terry, formerly manager of the Cleveland and Pittsburgh offices of The Hydraulic Press Manufacturing Co., has organized the **Terry Machinery Co.**, a sales agency for metalworking machinery.

George A. Grantham has been appointed chief engineer of **Weddell Tools, Inc.**, Rochester, N. Y. Mr. Grantham was formerly associated with Messrs. Richard Lloyd, Ltd., England.

John C. Wilson has been elected vice president and a director of **Thompson Grinder Co.**, Springfield, Ohio. Mr. Wilson's ten years with the company include service as chief engineer and sales manager.

Crown Chemical Corp., Guilford, Conn., has purchased the **Bellis Heat Treating Co.**, of Bramford, according to announcement by Dr. Haig Solakian, president.

W. B. Merriam has been elected president of **Globe Products Mfg. Co.**, Los Angeles, Cal., according to a recent announcement. At the same time **R. E. Lockard** was elected vice president, sales, and **Thomas O'H. McArdle** was appointed head of the contract division.

Harry H. Rose has been appointed general manager of the **Simmons Fastener Corp.**, Albany, N. Y., it has been announced. Mr. Rose has been general sales manager of the company for the past two years.

Frank G. Lincoln has been elected chairman of the board of **Hy-Pro Tool Co.**, New Bedford, Mass., subsidiary of **Continental Screw Co.** Mr. Lincoln was, until his retirement in 1946, with the Morse Twist Drill and Machine Co. for 43 years.

Frank G. Lincoln

John R. Bartizal

John R. Bartizal has become executive vice president of **Clearing Machine Corp.**, Chicago, according to a recent announcement. Mr. Bartizal has been associated with Clearing since 1945, when he became controller.

John S. Conant has been appointed director of procurement of **Willys-Overland Motors**, it has been announced. For the past six months general purchasing agent, Mr. Conant was formerly with Technical Managers, Inc., New York.

Snyder Tool and Engineering Co., Detroit, has purchased **Arthur Colton Co., Detroit**, builder of production machines for the drug, plastics and packaging industries. All manufacturing operations will be transferred to the Snyder plant but the subsidiary will retain its name.

Miles K. Smith has been appointed vice president and technical director of **Jessop Steel Co.**, Washington, Pa., it was announced. Mr. Smith was formerly with the Molybdenum Corp. of America.

Miles K. Smith

Floyd Rose

Floyd Rose has retired as chairman of the board of **Firth Sterling Steel and Carbide Corp.**, it was announced. Mr. Rose will continue as an active member of the board.

At a stockholders and directors meeting recently it was voted to terminate the engineering service operations of **Engineering Service, Inc., of America**, Detroit. Work formerly performed by the company will be handled by the **Murray Engineering Co.**, a new organization.

J. K. Smit & Sons, Inc., has announced the completion of their new plant in Murray Hill, N. J., which has involved the moving of their entire New York plant to the new location. Moved by departments, the plant was scheduled for complete removal by Feb. 15.

T. C. Glenn has been appointed manager of the engineering division of **General Electric's** newly-created Michigan district, it has been announced by A. R. Hines, district manager.

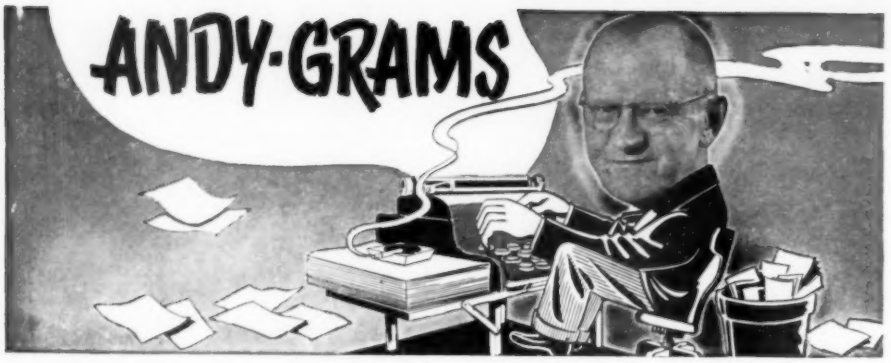
C. A. Scharschu, formerly director of research, has been appointed assistant technical director of **Allegheny-Ludlum Steel Corp.**, it was announced by F. B. Lounsberry, technical director. **Dr. L. C. Hicks**, associate director of research, will assume Mr. Scharschu's former position.

OBITUARIES

Hugo L. Olson, president of **Sundstrand Machine Tool Co.**, Rockford, Ill., died recently after a short illness. Mr. Olson joined the Rockford Tool Co. in 1910, and remained with the company through several corporate changes, becoming president of the Sundstrand Machine Tool Co. when it was formed in 1926.

J. William Ekegren, secretary-treasurer of the **Accurate Bushing Co.**, Garwood, N. J., died recently. Mr. Ekegren had been with the company since 1942.

Charles Cameron Carr, veteran ordnance authority, died recently at his home in Cincinnati after a long illness. Mr. Carr's 44 years service with the **R. K. LeBlond Machine Tool Co.** included sales and manufacturing assignments both in this country and abroad.



Weary and ill at ease, my fingers wandered idly over the noisy keys as I sat me down to the typewriter trying to think of something to say. Then, happily, past Prex Frank Shuler called me up, saying he wanted to "start an argument with a Swede." Seems that Frank took exception to the February Fundamentals. For one thing, the operation sheet was all wet—" . . . don't you know that when you assemble two parts you use a new part number?", and: "What do you mean milling the mating flanges on a horizontal miller? You use a vertical miller for a job like that."

Well now, who am I to argue machining methods with a Who's Who among the Masters of Mass Production? But then, "I vas there too, Sharley," in that game, so let's have some fun. For one thing, I know all about changing part numbers as assembly progresses, but in this instance it wasn't so much a case of part numbers as of pattern numbers, as shown on the plates of the mating castings. For another, the operation sheeet was frankly informal and only intended to suggest machining operations and tool setups that the student could mull over while waiting for the following installment.

As for the choice of a horizontal miller, I'll stick to a conviction that any time a part can be clamped close to the table and milled down against it with a face mill held close to the spindle one will get high production with a minimum of chatter. It's tantamount to climb millings and furthermore, entails simpler and less expensive tooling, as may be established by referring to alternate methods shown in the current Fundamentals. That is, all other things being equal, naturally, a vertical production miller will out-perform a horizontal miller that's too light for the job. But that works both ways.

As stated time and again, the Fundamentals are essentially written for students and beginners, and you can't give 'em the works all at once. However, a lot of the old timers seem to take quite an interest in the series as well, but whether they get something out of it —some do, by the way—or just want to kibitz I can't say. Anyway, it's quite a job trying to hit a happy medium between veterans with know-how and beginners who've yet to know how.

Well, so much for that. Personally, I'm neither alibiing nor apologizing for the job, nor am I averse to criticism. What the heck!—do nothing and you can't be criticized. As for arguing with Frank Shuler, I was so tickled over tangling with him that I'd have said yes if he'd called the moon a Frankenmuth cheese. And if the rest of you boys North, East, West, South will jump me once in a while we'll make this Column a forum for some interesting discussion. So damn the torpedos and fire when ready, the target being wide open.

In this connection, I got talking with Harry Conrad about the Andygrams, and I said it's a tough chore trying to be interesting. Or is it? Anyway, he suggested that, in mentioning names, perhaps the boys on the West Coast may not know a guy mentioned who might hail from Texas or Maine and vice versa. Conceded, along with the thought that a member up in Oregon may not know a fellow ASTEer down San Diego way.

Well, the Society has been multiplying too fast for this modern idea of family spacing, as it's called. But, we're a united family regardless and a friendly Society at heart and there's always a mutual friend to serve as a go-between for a friendly handshake across borders — yes, and across the waters as well. And friendliness begets friendliness.

Got out to the home — Detroit — Chapter's February meeting where, tabling with Monta and Mrs. Cox, Jim Ellsworth and U. S. James—the latter pouring just like at a social tea—I won me a pencil. That is, I found it on the floor and matched Mrs. Cox for it which makes possession illegally legal. It's got a bubble on one end in case anybody wants to lay in a claim.

The Society brass at the head table included Joe Siegel, Bill Smila, Bert Carpenter, Walter Wagner and Al Sargent in 1, 2, 3, 7 and 15 order of succession of Past Prexies, and Prex-Irwin Holland as guest of honor and speaker of the evening. Bob Ford, erstwhile of Pittsburgh but now Ex-Cell-o-ing in Detroit—a good man no matter where he is. Grant Wilcox who, like Cal Coolidge, doesn't choose to run; Harry Conrad; Andy Carnegie, who won the blue ribbon as Delegate; and Slim McClellan, another good man and true whose shadow's no lesser. Present with the rest of us "below the salt," Elton Hall and his tool engineers from Pontiac.

An impromptu talk by Len Kiefel, local Editorial Ch'man, went over in a big way. Len seems to have plenty on the ball and should go places. Get behind the guy; he needs help on a tough chore. Irwin Holland, who functioned in many capacities during the evening, paid a fine tribute to the Grand Old Man of Detroit Chapter — A. N. Goddard, of Goddard and Goddard, under whom he served his time — oh, a while back as time goes, A. N. got the rising acclaim as befitted seniority.

From one thing to another, I see where the Hounds are to reconvene at the Annual in Pittsburgh, that being where the Playhouse of the ASTE had its genesis back in '38. And what a time that was. Me, I've still got my Snoopie hound albeit he's limping some from the mauling of grandchildren and other tots to whom he's been a faithful playmate. Well, have a good time, Hounds! — If I'm not there in the flesh I'll be with you in spirit.

Right now, the March book "put to bed," I'm getting ready to go to Tri-Cities Chapter for a few words and wondering how in heckelfelt I can include Madison and Fox River Valley and Madison Chapters—whose meetings coincide—having had invites from Lorenz Liefer, Fred Kessenich and Roger Waindle. Well, these live wires are prime movers in ASTE work. I understand that Roger's been stepped up at Elgin Nat'l Watch—at least, he should be, having plenty of what it takes—and Fred is spark-plugging a tool engineering course at Wisconsin U. Well, I'll try, albeit having promised to speak on the opportunities in tool engineering at Tri-State College, Angola, Ind., enroute. And 7.40 AM to boot! But that'll be all past tense when you get this, and I may tell you about it in April. Right now, I'm down to the final ●

Handily yours,

Andy

THE TOOL ENGINEER'S *Service Bureau*

FREE BOOKLETS AND CATALOGS CURRENTLY OFFERED BY MANUFACTURERS

Bronze, Phosphor

Illustrated 28 page data book covers, in specific sections, material on strip, sheet, wire, rod, rope, castings, bushings and ingots. Tabular data on physical properties, chemical analyses, etc., included. *The Phosphor Bronze Corp.*, 2200 Washington Ave., Philadelphia 46.

Casting, Centrifugal

Central-Die Castings, a 12 page bulletin, gives detailed information on the Centri-Die process of centrifugal casting in permanent molds. Illustrated with typical cross sections and photos of castings. *Lebonon Steel Foundry*, Lebanon, Pa.

Controls, Feeding

A 4 page folder—Bulletin DC-208—describes the Power Check precision feed controller. Attached to the moving element of any feeding mechanism, the device may be employed to automatically retard speed and to ease pressure at any or all points of feed travel. *National Pneumatic Co.*, Industrial Division, Rahway, N. J.

Controls, Hydraulic

Illustrated four page folder AB L-43 describes water-hydraulic high pressure controls for hydraulically operated equipment, accumulators and combinations for sequence operation. *Hydropress, Inc.*, 570 Lexington Ave., New York 22, N. Y.

Conveyor, Belt

Recent four-page bulletin describes line of interfloor escalator-type belt conveyor. The power belt conveyor can be used wherever large quantities of merchandise must be moved from floor to floor. *The Rapids Standard Co., Inc.*, Grand Rapids, Mich.

Design, Welding

A reprint of "Design for Welding" by T. B. Jefferson, The Welding Engineers for October, 1948. An illustrated treatise on design, processes and types of welds for different materials. Available from the *James F. Lincoln Arc Welding Foundation*, Cleveland, Ohio.

Extrusions, Brass and Bronze

Four page bulletin covers brass and bronze extrusions produced by Titan, together with chemical compositions and physical properties of alloys commonly used. *Titan Metal Mfg. Co.*, Bellefonte, Pa.

Gages

Catalog 48 G, 46 pages, combines a catalog and extensive price list for the Threadwell line of fixed gages. Reference tables are set up to facilitate price finding for this new line. *Threadwell Tap and Die Co.*, Greenfield, Mass.

Gages, Magnetic

"Magnetic" gages for continuous gaging, and the "Magnetic" Schuster gage are described in an 8 page bulletin showing various installations. These gages continually indicate thickness or width of strip stock and diameters of wire as the product comes off mills or wire drawing machines. *Pratt & Whitney Division, Niles-Bement-Pond Co.*, West Hartford, Conn.

Heaters, Unit

Termed a "practical work-book on unit heaters", 38 page Ilg Unit Heater Catalog No. 348 is designed to cover all factors in unit heating systems and specifications of equipment. Condensed information covers estimating of requirements and "short" method of determining sizes of units for heating the "vital zone"—the area extending from floor to the level where people work, live or play. *Ilg Electric Ventilating Co.*, 2850 No. Crawford Ave., Chicago 41, Ill.

Humidifiers, Steam

Steam humidifiers for automatically controlling relative humidity for prevention of dry air damage to hygroscopic materials are described in a 12 page bulletin. Also described is the effect of relative humidity on human comfort and health, and how proper humidity reduces fire hazards. Bulletin No. 1771, *Armstrong Machine Works*, Three Rivers, Mich.

Inspection, Chain

An 8 page booklet gives procedure for inspection, care, maintenance and repair of alloy chain. *S. G. Taylor Chain Co.*, Hammond, Ind.

Jig Boring Machine

A 16 page bulletin describes the Type 4C Hauser Jig Boring Machine, with specifications and dimensions as well as the accessories available for practically any type of precision boring. Typical tool setups are also illustrated and described. *The Hauser Machine Tool Co.*, Manhasset, N. Y.

Magnets, Rectangular

A 12 page bulletin—Triple Pole Magnetic Catalog No. 301-A—illustrates the use of various types of rectangular magnets used for prevention of tramp iron damage to equipment, protection against fire, explosions and product contaminations, as well as for recovery of tools and scraps. Illustrations show installations in connection with belt conveyors and liquid conveying lines. *Dings Magnetic Separator Co.*, 4740 W. McGeogh Ave., Milwaukee 14, Wis.

Mechanical Differential

"The Application of Small Mechanical Differentials to Instrument and Control Work," is the title of a concise manual recently developed. Principles and theory of operation are explained. *Milwaukee Lock and Mfg. Co.*, 5076 North 37th St., Milwaukee, Wis.

Micrometer, Electric

Folder describes an electric micrometer for measuring, gaging, comparison and telemetering, the latter giving remote indications at distances up to 100 feet. Catalog 227, *Stevens-Arnold Inc.*, 22 Elkins St., So. Boston 27, Mass.

Presses, O. B. I.

A "thumb-nail" catalog—Form L-8—describes a line of open back, inclinable punch presses in back geared and plain fllywheel type. *L & J Press Corp.*, Elkhart, Ind.

Racks, Storage

Barret Bulletin 4873, sixteen pages, describes how storage capacity can be multiplied several times by efficient use of overhead space. Illustrations also show how large areas of floor space are rendered available for production operations after storage racks are installed. *The Barret-Cravens Co.*, 4609 S. Western Blvd., Chicago 9, Ill.

Sound Control

A 16 page brochure—"Sound Control"—covers noise quieting, acoustical correction and vibration isolation. Typical installations are illustrated and construction details show late applications. *Johns-Manville*, 22 East 40 St., New York 16, N. Y.

Tool Heads, Boring and Facing

An 8 page bulletin describes the Chandler-Duplex line of combined boring and facing toolheads. Illustrations include the several types of heads with suggested tool combinations and setups for various operations. *Chandler Tool Co.*, Muncie, Ind.

Turrets

Toolpost, tailstock and turrets are described, along with engineering data, in a 16 page bulletin—Catalog No. 48—by *Enco Manufacturing Co.*, 4522-24 W. Fullerton Ave., Chicago 39, Ill.

Walls Transite

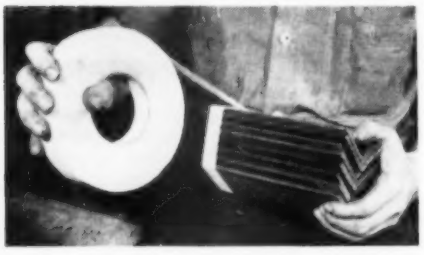
"Transit Movable Asbestos Walls" is title of a 24 page brochure presenting facts about movable walls and partitions for designers, builders and maintenance men who wish to alter building layouts to meet changing conditions. Illustrated with construction drawings and photographs of installations. *Johns-Manville*, 22 E. 40 St., New York 16, N. Y. N. Y.

Welding, Inert Gas

Bulletin 1.102, four pages, describes applications and advantages of inert gas welding in industry. Helpful for those using helium, argon or atomic hydrogen arc welding methods. *Fansteel Metallurgical Corp.*, North Chicago, Ill.

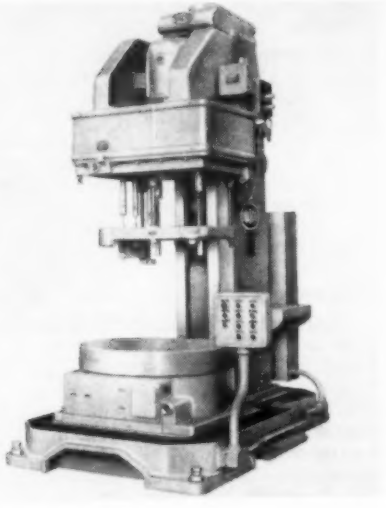
TOOLS OF TODAY

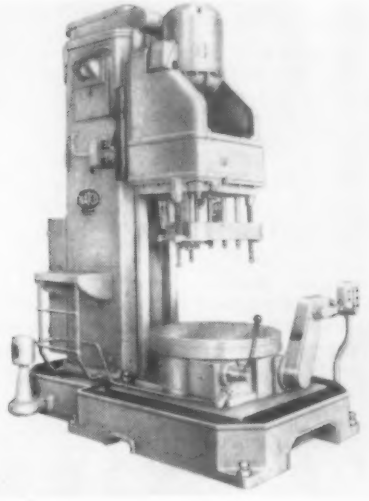
Paper Wrapping Tape



A paper tape, said to be strong enough to compete with metal strapping and rope for heavy duty packaging, is announced by the producer, Minnesota Mining and Manufacturing Co., 900 Fauquier St., St. Paul, Minn. Designated No. 320 in the "Scotch" brand industrial tape line, and having a tensile strength of 180 lb per inch of width, use of the tape eliminates packaging equipment and saves workmen cuts and similar injuries, the producer claims. The tape is thin—13-15 mils—and flexible and has a pressure-sensitive adhesive which grips immediately upon contact.

The tape is designed for use in packaging metal pipes, conduits, etc., by wrapping it once around the load and back on itself. **T-3-1**

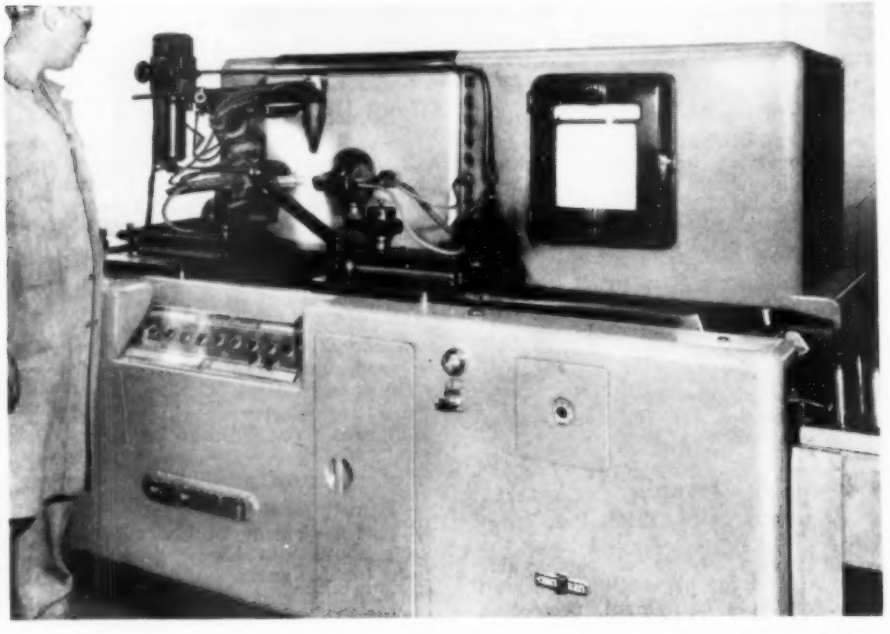




NATCO Introduces Improved Holesteel Machines

National Automatic Tool Company, Richmond, Ind., has introduced a line of "Holesteel" production machines, designed for drilling, boring, and tapping on high production as well as general miscellaneous work. Models C2A and C3A—illustrated left and right—and Model C4A are both of single-spindle and fixed-center multi-spindle construction and incorporate an electrically controlled feed system to provide infinitely variable feed selection within the specified range.

Each model can be supplied with either large or small base, the former supplied for adjustable table applications or for stationary fixture mounting. The large base is suitable for rotating and sliding type fixture applications. Models C2A and C3A can further be supplied with an adjustable knee-type table. In either case, provision is made for return of coolant to the machine base. **T-3-2**

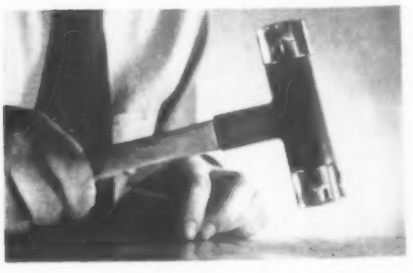


Flamatic Selective Hardening

As developed by Cincinnati Milling Machine Company, Cincinnati, Ohio, Flamatic selective hardening confines heat to that portion of the workpiece that is to be hardened and is said to control temperatures used to an exacting plus or minus 5 degrees of critical pre-set values.

Metallurgical and physical properties required by the heat treating operation may be rigidly and exactingly obtained and controlled by the Flamatic process, with high production output realized through automatic operation and fast-cycle simplicity. Typical of the wide range of work that can be done by the method is the action shot of Flamatic selection surface hardening of a spline shaft at the Rockford Clutch Co., Rockford, Ill. **T-3-3**

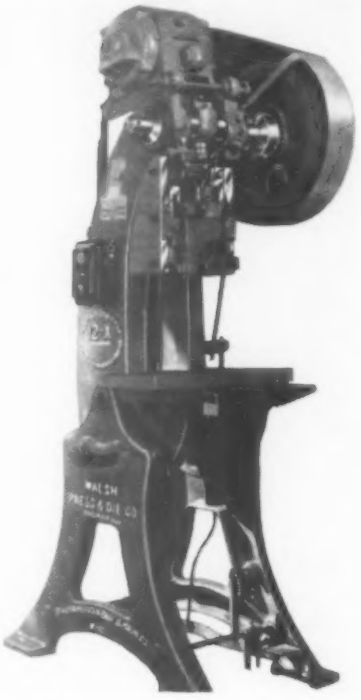
Non-recoil Hammer



A Non-Recoil Hammer—the "Tahlen", by Drake Industries, 681-683 E. Hastings St., Vancouver, B. C. — incorporates Tenite tips held in a hollow head loaded with a charge of steel grit. As the charge follows the blow it is said to practically eliminate recoil and also to reduce shock on the wrist and arm of the user.

The tips, of cellulose acetate butyrate Tenite—a product of Tennessee Eastman Company—are molded by Plastal Specialties Co., Seattle Wash., and are said to withstand heavy impact without cracking or flaking. **T-3-4**

Deep Throat O.B.I. Press



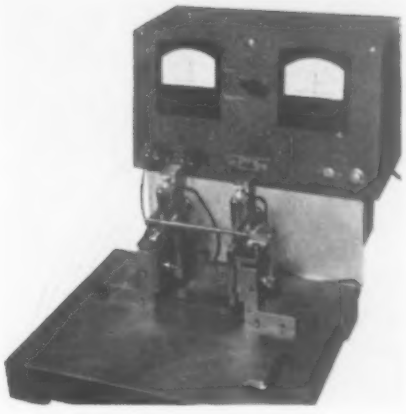
No. 12X open back inclinable Flywheel Punch Press has been added to the line of presses by Walsh Press and Die Company Division of American Gage and Machine Company, 4709 West Kinzie St., Chicago 44, Ill. The No. 12X is not only suitable for die-casting trimming operation but also for secondary forming operations on sheet metal as well as many other punch press operations. This press is available with 1½ to 4 in. stroke and 9 in. shut height, with throat depth of 6 in., thus making it adaptable for operations where bulky dies with low tonnage are required.

The press incorporates such Walsh features as alloy steel die-forged high tensile strength crankshaft, precision ground and hand-scraped into special hard bronze bearings, and high tensile strength press frames. The Walsh two-button Safety Device with non-repeat attachment as well as air ejectors can also be furnished. **T-3-5**

Dual Inspection Gage

A Two-Channel Inspection Gage has been developed by Graham-Mintel Instrument Co., 2443 Prospect Ave., Cleveland 15, Ohio, for fast, definite and simultaneous inspection of two diameter.

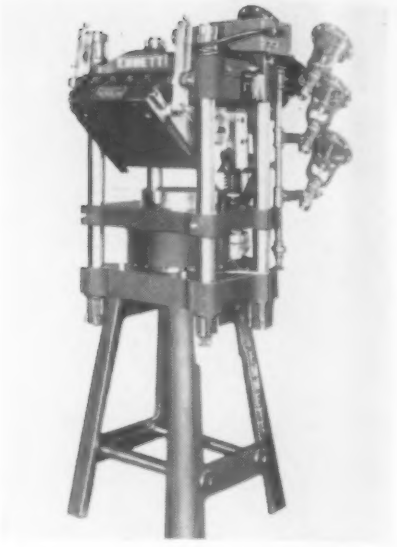
The induction type measuring heads are designed to operate without friction and are provided with 0.025 in. range



of fine adjustment for ease in setups to various sizes and fast corrections for wear. Each head is independently adjustable, with zero-setting done on masters. In many cases the heads can be applied to existing stands with but a few changes, or stands best suited to the range and sizes of workpieces can be supplied.

The amplifier operates on 110 volts, 60 cycles and is voltage regulated from 95 to 125 volts. Two continuous, linear scales, divided into half thousands or in half tenth of one thousands, have approximately 5/16 in. spacing per thousandths or tenths, and are said to permi fast reading to 10 millionth of an inch **T-3-6**

Turn to
Page 81
for Handy
Tools of Today
Coupon



Tilting Type Transtacker

A light weight, tilting type Transtacker, including the suspended fork feature of an earlier Transtacker model, is announced by the Automatic Transportation Co., 149 West 87th St., Chicago, Ill.

This battery-operated hand truck is available in two models: single lift—SCL, 3400 lbs—and telescopic—SCLT, 4000 lbs.—both engineered to permit passage through standard 7 ft. factory doors and for full use of storage facilities which often are wasted. Single lift is 64 in., and telescopic 120 in., respectively.

Backward tilt is a full 21 degrees safe cradling of the load, while 5° forward tilt simplifies loadspotting. Light weight permits use in many elevators and factories where floor capacities are limited.

T-3-7

Hard Surfacing Powder

An improved hard surfacing powder —called Surfaceweld A—is announced by the Lincoln Electric Co., Cleveland, O. The powder, to be applied with a carbon electrode, is used for depositing a thin chromium carbide type of hard surface that is said to be highly resistant to abrasive wear and corrosion.

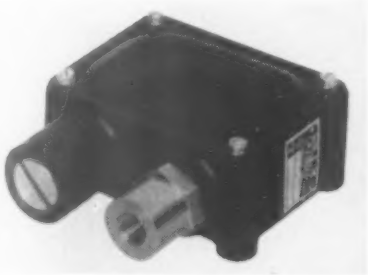
Operating characteristics give it a wide field of application, one of which is its ability to be used with an AC arc with a single carbon electrode. It may also be applied with a twin carbon arc or may be used with DC, carbon electrode negative.

The powder is designed for surfacing applications where the use of hard surfacing electrodes is not always practical, as for example on thin work, thin deposits, or for use with small AC welders. It is also used in preference to hard surfacing electrodes for certain conditions of severe abrasion. The powder forms a paste when mixed with water which adheres to flat and curved surfaces.

Radio Interference Out

A system for eliminating annoying welder-caused radio interference, developed by General Electric Co., is now being incorporated into the manufacture of all G-E Inert-Arc welders, the company has announced.

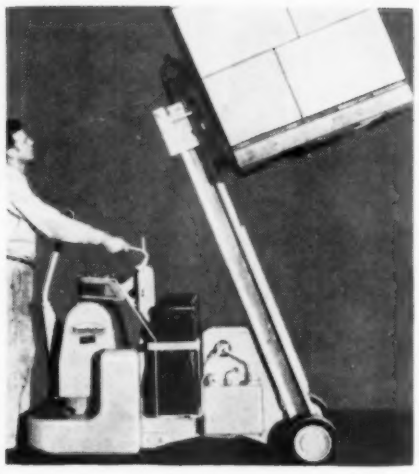
Other types of welding equipment formerly used for inert gas shielded arc welding emit a high frequency radio signal which is a source of frequent annoyance to the radio listening public and to some commercial radio services. By using what G-E engineers termed a "balanced wave" combined with a new built in control, this continuous signal is eliminated, reducing the duration of welder-caused radio noise to a small fraction of a second—an interval so short as to be comparable in effect on radio reception to the flicking of a home light switch. **T-3-8**



Industrial Pressure Switch

A Pressure Switch has been developed by Saval, Inc., 1915 E. 51st St., Los Angeles 11, Calif., for making or breaking an electrical connection when hydraulic fluid reaches a predetermined pressure. It may be used as safety control on pumps, or as a control on automatic hydraulic machines or presses where pressure control is required or where cycling is controlled by fluid pressure.

The units are available in six pressure ranges from 50 psi minimum to 10,000 psi maximum, for water, oil, or air service and for AC or DC operation with normally open or normally closed electrical circuit. **T-3-9**



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Backward tilt is a full 21 degrees safe cradling of the load, while 5° forward tilt simplifies loadspotting. **T-3-10**

Automatic Dial Index Feed

An automatic Dial Index Feed for punch presses, announced by de Castro & Associates, 2477 Randolph St., Huntington Park, Calif. The standard table of the "Speedex" is 12 in. in diameter, with larger tables available on special order. The die space, located on the rear of the table is 3½ x 3¾ in., overall height is 3½ in., and space is provided for air ejectors and automatic loading mechanisms.

The unit, which can be adapted to any ordinary large or small punch press, without altering the press, is driven by means of an eccentric on the crankshaft of the press. Because of the positive feed mechanism, the "Speedex" will repeat and lock itself at each stroke of the press.

The tool is designed to increase production severalfold on second operation work such as assemblies, broaching and the like, by permitting the press to operate continuously either hand fed or by means of a magazine or hopper.

T-3-11

Scale For Hoists

A scale, primarily designed for use with hoists and cranes, by Hydroway Scales, Inc., 7632 Fenkell, Detroit 21, Mich., operates on the static pressure principle and therefore employs no springs or levers. The Hydroscale, as it is called, is immediately available in 2-ton model, with 5- and 10-ton models said to be had on 30-days delivery.

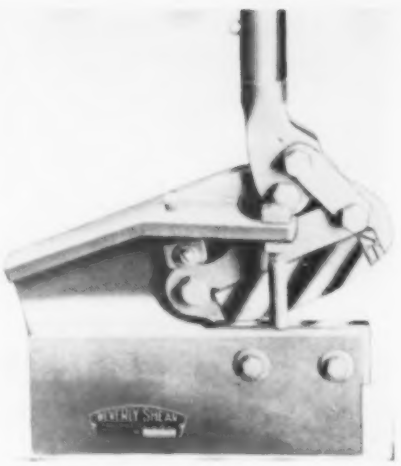
T-3-12

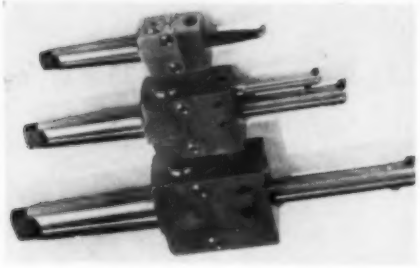
Portable Slitting Shear

A portable Slitting Shear with capacity of ⅛ in. in mild steel and 10 gauge in stainless, is announced by The Beverly Shear Mfg. Co. of Chicago. An adjustable shoe, which provides additional support at the toe of the upper blade holder, is said to give increased strength and cutting efficiency.

A heavy frame is used to provide the necessary rigidity and strength to assure sharp, clean cutting and to prevent any side play or movement of the blades when making cuts in heavy gauge steel. Shear blades are interchangeable and adjustable. **T-3-13**

Use Coupon on Page 81





Precision Boring Heads

A line of Mastur precision Boring Heads, by the Maxwell Company, Bedford, Ohio, is designed for precision boring operations. The heads, which are furnished in three sizes, are compact and rigid yet provide exceptionally large boring capacity.

No. 5 has capacity to 7 in.; No. 6, 11 in. cap.; and No. 7, 15 in. capacity. Shanks may be had in No. 5 and 6 Morse and 11 and 12 B & S taper, and 2 in. straight. The heads have provision for mounting tools laterally as well as in line, thus permitting step boring and facing in one or several setups, as desired.

The screw head is graduated in 50 divisions providing reading in thousandths, while the body is graduated to give vernier readings plus or minus 0.0002 in. **T-3-14**

Automatic Airlectric Machine

An automatic Airlectric gaging and classifying machine for refrigerating unit muffle boxes, developed by The Sheffield Corp., Dayton 1, Ohio, incorporates two identical mechanisms for gaging, classifying, and stamping. One spindle is unloaded and loaded by the operator while the other mechanism is going through the gaging cycle. Maximum rate of operation is said to permit the checking of 1500 parts per hour.

The operator manually places the part in gaging position, which automatically starts the cycle. A clamping device descends and properly locates the muffle box for gaging. The average diameter of the counterbore is checked with a multiple orifice solid tungsten carbide spindle connected with a series of Airlectric gaging heads, and its classification—one of three (A-B-C) of 0.0003 in. tolerance each—is retained by a "memory" device. At the same time, the depth of the counterbore is checked and its classification set up, one of seven of 0.0003 in. each.

The final classification—one of 21 of 0.0003 in. each—is then automatically stamped on the muffle box by means of air operated metal die stamping mechanisms. A letter represents the diameter classification and a numeral the depth classification. Should the muffle box bore be beyond tolerance limits, lights indicate which dimension is out of tolerance, and the stamping device is not actuated. The machine will not cycle if a part or a master is not in gaging position.

This machine supplements another Sheffield automatic Airlectric machine which gages the lapped valve plates that form a part of the muffle box assemblies. The valve plates are gaged, classified and segregated into 27 classifications, including combinations of undersize and oversize. The machines are used together in making selective fits of the two components. **T-3-15**

Pressure Flow Charts

Air and hydraulic pressure and flow Charts that provide much useful data that would otherwise require laborious calculations, may be obtained at no obligation from Miller Motor Co., 4027 N. Kedzie Ave., Chicago 18, Ill., manufacturers of standard air and hydraulic cylinders, boosters, air hoists, counterbalance units and related products.

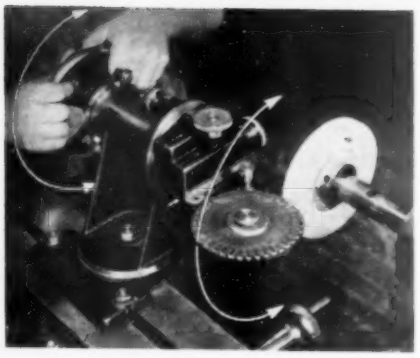
The charts contain easy-to-read, attractively laid-out data tables for fast, convenient reference. One table gives push and pull stroke pressures in lbs. for various cylinder sizes with various piston rod diameters, at pressures from 50 psi to 3,000 psi, also, the oil consumption of hydraulic cylinders and air consumption of air cylinders from 1½ in. to 20 in. bores.

The chart also gives recommended piston rod diameters for various loadings and mounting conditions, a feature frequently overlooked in cylinder application. Also, recommended lengths of stop tubes placed inside cylinders. The chart is available in two sizes: a 3-color 22 x 34 in. wall chart; and an 8½ x 11 in. size in black and white, perforated for convenient ring binder insertion.

Air Impact Hammer

Developed to replace more expensive and complicated punch presses, the Bryand Model Z-6 Air Impact Hammer, by Blank Machine Tool Co., 3111 E. Michigan Ave., Jackson, Mich., is said to find a widely diversified application in metal working, plastics and textile shops. The tool is designed for light stamping and forging, straightening, trimming, molding, crimping, coining, riveting, piercing, staking and forming in a variety of materials.

Stroke is constant, and impact pressure may be varied from 2800 lbs. to 40,000 lbs. or up to maximum capacity at 100 lb. line pressure. All moving parts that are subject to wear are hard chrome plated, construction is simple and speed of operation by hand or foot control is said to be approximately 60 strokes per minute. **T-3-16**

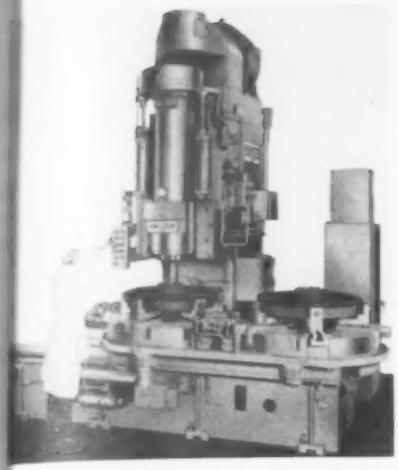


Radius Grinding Fixture

A Radius Grinding Fixture, by Hill Machine Co., 1032 Mulberry St., Rockford, Ill., is designed to facilitate grinding of radius side milling cutters to a true radius through any arc up to 18[illegible] degrees, with perfect blending into the straight lands. Takes cutters up to 6 in. diameter.

The fixture is mounted on a standard tool and cutter grinder and holds the cutter in the proper relation to the grinding wheel. The radius is ground by rotating the spindle of the fixture with the hand wheel for each tooth of the cutter. A straight grinding wheel is used, with the face dressed parallel to the table of the grinder. The entire face of the wheel is used, thus avoiding wearing a groove and obviating repeated dressing.

T-3-17



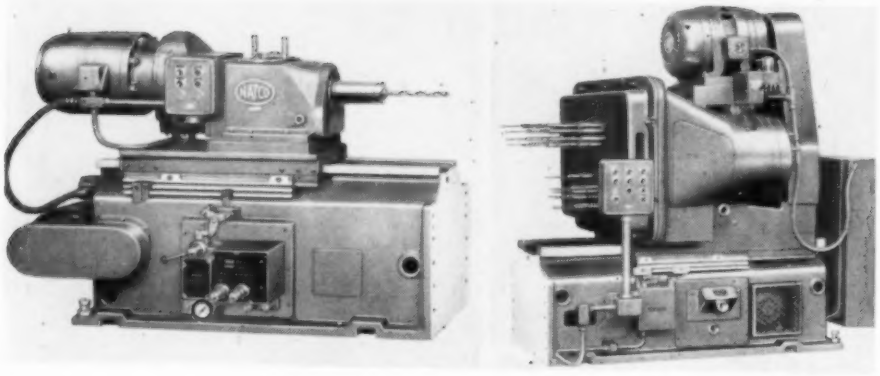
Car Wheel Boring Machine

Increased production 4 to 1, in rough boring railroad car wheels and similar large forgings and castings, is claimed for a machine designed and built by Snyder Tool & Engineering Co., E. Lafayette, Detroit, Mich. Tungsten carbide tools are used in this particular application and remove 1 in. of stock from a 5-¾ in. diameter pierced hole 7½ in. long in a steel car wheel. Stated cutting time is 55 seconds per wheel.

While the unit shown is applied to rough boring car wheels, a similar machine is available for finish boring on any type of large casting or steel forging.

The machine has two stations and is equipped with a hydraulically operated shuttle slide which moves the workpiece from the loading station to the work station, then shuttles it beyond to the unloading and reloading position. The fixture travels on automatically lubricated hardened and ground V-type ways, which allow for normal wear without developing side-play. Clamping is hydraulic. **T-3-18**

Floor Type Units For Way Type Machines



Natco Holesteel Floor Type units, by National Automatic Tool Co., Richmond, Ind., are production machine tool units designed to incorporate in the construction of way-type machines for drilling, boring, tapping and like operations.

Dependent upon the application and production requirements, they are arranged with standard single-spindle heads, fixed center multi-spindle heads, or adjustable multiple-spindle heads complete with other standard adjustable spindles or slip-spindle plates and spindles, as per models C2FT and C4FT, shown.

The electrically controlled hydraulic feed system provides an infinitely variable feed selection within specified range, while electrical push button control provides for routine set-up control. The bed is a cabinet type heavy box structure designed to prevent deflection under the heavy thrust loads encountered. The ways are of close grained high tensile cast iron; however, hardened and ground steel ways can be furnished at an additional charge.

The cabinet section forms a compartment enclosing hydraulic pressure pumps and all of the hydraulic system piping. The hydraulic feed control panel is mounted on the left side of this compartment, while on the right side is located an instection cover and a protected oil filler opening. Electrical limit switches, which work in conjunction with the hydraulic panel, are also located on the right side.

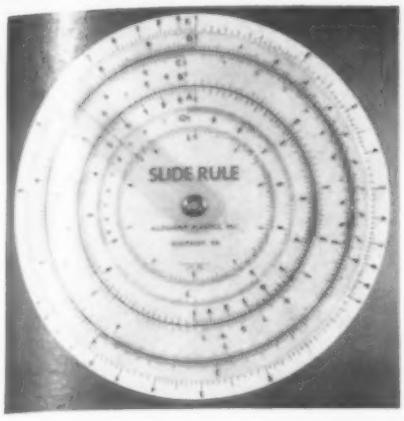
The single-spindle head is direct motor driven and antifriction mounted. Sliding gears, which are lever operated, allow a selection of seven spindle speeds, within range selected, through splined pick-off gears. Adjustable spindle heads are also of anti-friction mounted construction in which each spindle drive has independent spindle speed changes. Adjustable spindles may be located in any position within the area of the head and a drive angle of 35 degrees or less. Vertical adjustment of 2 in. is used to compensate for tool wear or difference in length, while fine adjustment through a screw allows facing and depth setting with accuracy.

The slide power cylinder is mounted between ways and, through a control system, provides a cycle sequence of rapid advance, coarse feed, fine feed, rapid reverse and stop.

The control panel includes directional control, feed rate control, pressure gage, pump relief valve for pressure control, and solenoids for electrical remote control. Two infinitely variable feed apertures control feed through a specified range and, working in conjunction with feed apertures, a feed governor maintains selected feed rate regardless of fluctuations in the tool resistance, change in hydraulic pressure or break through of the tools. T-3-19

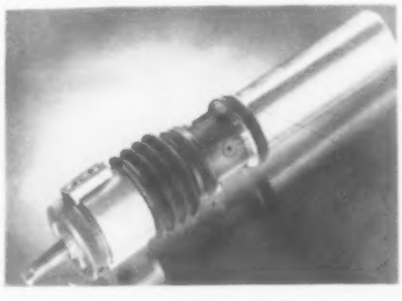
For Handy Coupon
Turn to Page 81

ircular Slide Rule



A low-priced circular Slide Rule, by Allegheny Plastics, Inc., Sewickley, Pa., performs the function of the conventional "slip stick" and is said to be only slightly less accurate than the more expensive rulers. Made of laminated plastic and only 4½ in. in diameter, the rule comes complete with instruction booklet and storage envelope. **T-3-20**

Small Size Recessing Tools

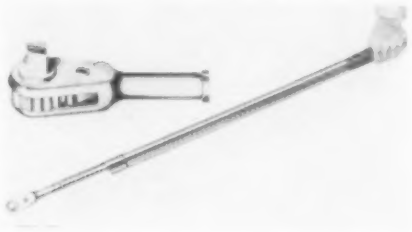


Two small size series "R" Recessing Tools, announced by The Maxwell Co., 250 Broadway, Bedford, Ohio, are said to be comparable in capacity to standard tools in line; however, their extremely small dimensions permit their use in applications where larger recessing tools cannot be used.

The small size series "R" recessing tools incorporate the same features as standard tools in the line, having a micrometer-adjusting collar which facilitates rapid and accurate recess diameter control to within 0.001-inch or 0.050-inch per tool revolution. In addition, the tool holding section has serrated clamp blocks which match identical serrations on cutter in the workpiece; also the entire series "R" features precision hard-chromed wearing surfaces to assure maximum tool life. Mandrel-built bellows-type rubber guard is furnished as standard with each tool to prevent entry of chips and other foreign matter into the working mechanism.

Models No. 1 and No. 2 tools have overall length of 2-13/16 and 4 inches, as compared to standard tool sizes which are 4-9/16 and 5⅛ inches respectively, and are available for cutting recesses from ⅜ to 1 inch and from 1 to 2 inches. Cuts can be taken at extremely high rate of feed. Tools are furnished having cutter ratio of either 1:3 or 1:1. **T-3-21**

Light Weight Torque Bar



A new heavy duty Torque-Bar which, according to the manufacturer, is many pounds lighter and therefore more easily handled than previous types, is announced by Richmont, Inc., 2810 East 11th St., Los Angeles 23, Calif. Known as the Livermont Torq-Bar, the maker claims extreme accuracy and ruggedness in torque ranges from 200 foot lbs. to 600 foot lbs.

The Bar is pre-set for specific torque requirements within its range, then, in operation, when the desired torque is reached, a loud "click" is heard. Simultaneously, a small button in the handle taps the operator's hand. Thus both "sound" and "touch" signals are given while the necessity for visual attention and consequent possibilities of misreading are eliminated. **T-3-22**

Multi-station Piston Gage

A Multiple Station Piston Gage for checking six dimensions simultaneously, by Pratt & Whitney, Division of Niles-Bement-Pond Company, West Hartford, Conn., is designed to facilitate the assembly of automotive pistons. In addition to checking it stamps two grades and automatically shows the number of pistons in each grade inspected.

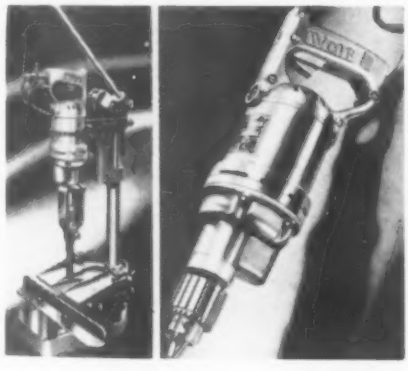
The gage uses Pratt & Whitney Electrolimit and Multiple Electric Contact mediums. The gage operates as the inspector pushes the piston into gaging position; then, a glance at the instrument panel will convey full information for each piston, including width of ring grooves. At the same time, the piston is automatically marked on top with the grades of the skirt diameter and pin hole diameter. T-3-23

Kam-Grip Drill Jig

Designed for production precision drilling, Model X-750 Kam-Grip Drill Jig, by Manufacturers Engineering Service, 419 Security Bldg., Toledo, Ohio, employs only one double-end anvil and one bushing plate to make the jig adjustable for work range from $\frac{1}{8}$ in. to $\frac{3}{4}$ in. in diameter. Drill sizes range up to 11/32 in., using standard slip drill bushings.

Clamping is accomplished by cam action which actuates the anvil vertically to and from locking position, with cushion effect to prevent marring the work. Operation is either manual or automatic, and the jig is furnished with locking-release rod for attachment to quill of drill press. **T-3-24**

Heavy-Duty Drill



A heavy-duty portable Electric Drill, by S. Wolf and Co., Ltd., London, England, is now available for immediate delivery through manufacturer's U. S. Representative, Fred L. Stuart, Room 1111, 33 W. 42nd St., New York 18, N. Y.

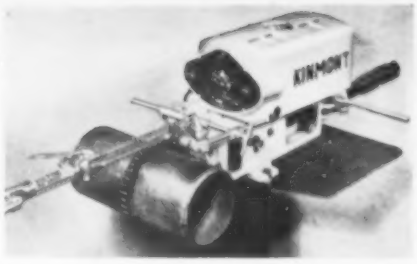
The drill—NW3C—is designed for continuous operation in heavy production work requiring precision standards. With its accessories, which includes a bench drill stand and a bench clamp stand, it serves also as a drill press and as a bench grinder. Capacity in steel, $\frac{3}{8}$ in. at 450 R.P.M. full load.

Also, by Wolf & Co., is a portable electric Chisel Mortiser, shown at left, mounted on a bench stand. This mortiser is an attachment for the drill shown mounted, the latter also serving for various work as outlined for the larger model. **T-3-25**

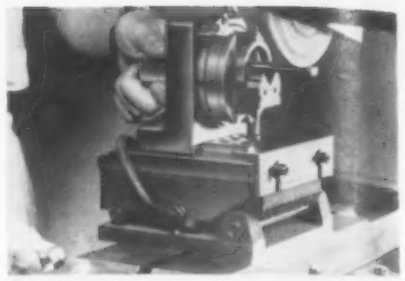
Cutting Torch Attachment

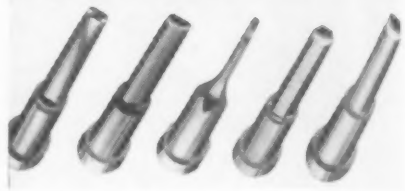
A torch cutting attachment, for use with the Universal Power Unit manufactured by the Kinmont Mfg. Co., Inc., Glendale, Calif., features easy and fast adjustment of the cutting torch in handling a wide range of pipe sizes, the while maintaining a smooth bevel and a square cutoff across the end of the pipe.

Adjustment range of the attachment permits its use on any pipe size from 3 in. up to 36 in. in diameter, and on tanks up to 10 feet in diameter when turned on a roller rack. The turning



speed of the power unit is controllable while cutting operation is in progress, thus assuring a smoothly finished cut. A foot switch, controlling the turning operation, leaves the operator's hands free to control the torch and speed adjustments. **T-3-26**





Perforator Grinding Fixture

A grinding attachment—the Grind ALL Fixture, by the Harig Mfg. Corp., 319 N. Albany Ave., Chicago 12, Ill.,—is designed for faster and more versatile grinding of irregular-shaped perforating punches.

In addition to regular and irregular contours, the attachment may be used for other grinding operations, and for concave and convex radius dressing. Its radius generating feature is said to make it particularly applicable to grinding of carbides. Accuracy is claimed to be within 0.0002 in. T-3-27

Lightweight Disintegrator

A lightweight, portable disintegrator —Model X—is announced by Elox Corporation, Clawson, Mich. Designed to remove broken drills, reamers and other cutting tools as well as hardened parts of assemblies from 0.085 in. up, the tool may be set up in a drill press for convenience of operation.

The user has only to supply city water and electricity at lighting current. Current consumption is small, and the tool requires only about two gallons of water per hour. Working voltage at point of contact with the broken tool is low—about the same as a flashlight—and may, therefore, be considered entirely safe. A self-feeding feature makes operation practically automatic once contact has been made. T-3-28

High Silver Alloy

A high silver alloy—Eutecrod 1700, by Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y., has been developed to supplant regular silver brazing alloys used for stainless steel, copper, brass, bronze, tungsten carbide and steel.

Thin flowing and bonding at 1020 to 1250° F., with tensile strength of 64000 to 68000 psi claimed, the alloy is especially recommended by the makers for making square, butt and "T" joints, and for filling and sealing small cracks and defects. Available in 1/64, 1/32, 3/64 and 1/16 in. diameters.

Selective Hardening Paste

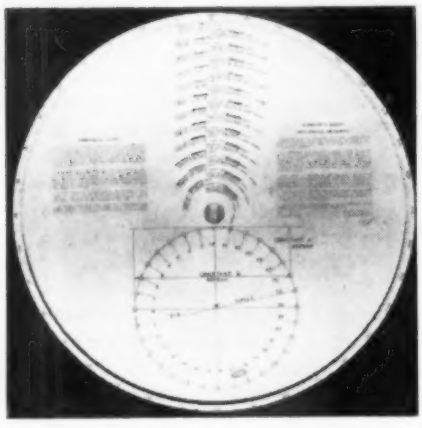
A paste, said to be both effective and economical for keeping part of a workpiece soft while the rest is carburized, has been developed by Denfis Chemical Laboratories, Inc., 172 Pacific Street, Brooklyn 2, N. Y. Known as Isopac, the paste is applied to the sections to be kept soft and left in place while the work is case-hardened. It can be applied whatever method is being used to carburize the work—box furnace, atmosphere, or salt bath—and is said to be easily removed after the work is quenched.

Portable Dust Collector

A self-contained, portable 2300 cfm Dust Collector—Model 20N30 Dustkop—designed for handling dusts and dirt or toxic fumes separately or in combination from various types of cutting, grinding and other machining, is announced by Aget-Detroit Co., 307 Ann Arbor, Mich.

The unit, which features recirculation of the cleaned air within the working space, employs a direct connection from the outlet of the cyclone separator to out-of-doors. The chief purpose of this unit is to remove the dust and dirt from the air stream while permitting the complete transfer of fumes from the working space to outdoors. **T-3-29**

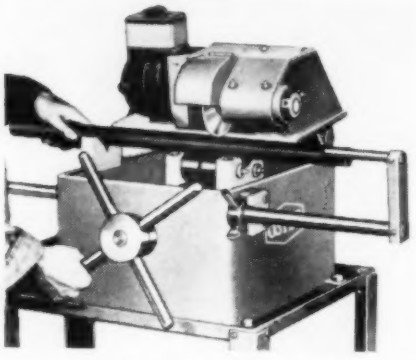
Chart For Hole Locations



Of particular interest to tool engineers and designers is a Chart for providing the exact figures for hole locations and angular movements, developed by the Engineered Charts Co., P. O. 551, Grand Central Annex, New York 15, N. Y. Within their limits, these charts also determining the length of sides of polygons.

Made of plastic and furnished four to a set, these charts were produced with the idea of eliminating the greater part of mental work and mathematics and save time in obtaining precise locations, both in rectangular and polar coordinates for all divisions up to and including 100. **T-3-30**

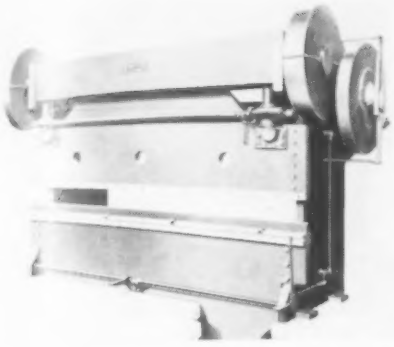
Pipe Cutting Off Machine



The No. 662 "Cut Master", by The Oster Manufacturing Co., 2057 East 61st St., Cleveland 3, Ohio, is designed for cutting off small or large quantities of pipe within the range of ¼ in. to 2 in. inclusive. As claimed examples of production obtainable: 60 pieces of 2 in. or 150 pieces of ½ in. pipe can be cut off in 10 minutes.

Motor, idler shaft and cutter shaft are mounted as a unit on a plate hinged to the base casting. As the hand wheel is turned, the cutter wheel is moved up or down; thus, effort of operator is reduced to a minimum by feed screw mechanism.

Pipe supporting rollers, mounted on needle bearings to permit the pipe to turn freely, are grooved to prevent breakage of the cutter wheel, which is ground to hold burr on pipe to a minimum. **T-3-31**



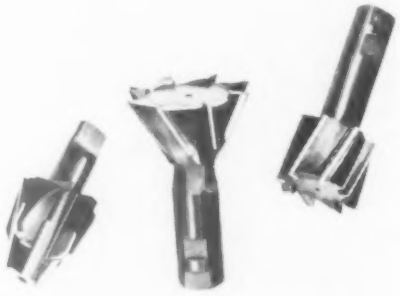
Press Brakes in Wide Range

Columbia Machinery and Engineering Corp., Hamilton, Ohio, has expanded its line of power press brakes to include a complete range of sizes from 120 to 900 tons. This expansion of the line gives metal fabricators a choice of models for forming mild steel ⅛ in. to 1 in. thick in lengths from 4 to 20 feet.

All sizes except the 120-ton model now employ twin-drive main gears. Back gears in all models operate in oil within an oil-tight case, and precision machine-cut steel gears are used throughout.

All models have motor-driven slide-adjustments with micrometer controls, motor and control being readily accessible to the operator. The slide is easily operated and can be adjusted out of parallel with the base. Slide ways are designed to provide full bearing with the housing guides, even the slide is operated out of parallel. Counters on each end indicate the magnitude of the adjustment in thousandths of an inch. Wedge-type release mechanism relieves the ram in case dies are bottomed to the extent that the brake stalls.

Standard bending and forming dies, die blocks and tool holders can be furnished and all models can be equipped with removable wide tables for use with wide dies or special punching setups. **T-3-32**



Carbide-Tipped Cutting Tools

Inserts of hard, tough tungsten carbide are electronically brazed onto the faces of cutting tools by U. S. Carbide Tool, Inc., 3266 E. 49th St., Cleveland 4, Ohio. Shown at left is a special form reamer taking 5 cuts—and, taper, face, chamber and diameter—in one pass.

At center is True-Spiral form milling cutter, and at right a True-Spiral end mill, these tools being typical of the broad line of carbide-tipped cutting tools manufactured by the company. **T-3-33**

Six Station Machine Features Double Loading

A special machine which permits double loading, by the Cross Co., Detroit, Mich., is said to have enabled a large automobile manufacturer to increase tremendously output of water pump bodies. Parts are milled, drilled, bored, reamed, and tapped at the rate of 90 pieces per hour with only one operator.

With each cycle of the machine, the operator loads a new water pump body at the first work position and transfers a semi-finished part from the first to the second position. Second operation work is completed simultaneously with the first chucking.

Because the parts can be loaded while the machine is cutting, and because ten parts are machined at one time progressively, production is stepped up materially. The machine has a six station, power-operated index table and has two station work holding fixtures for handling operations on opposite ends of the parts. **T-3-34**

Use This Coupon

FOR MORE INFORMATION ABOUT "TOOLS OF TODAY"

For your convenience, a key number follows the announcement of each product reviewed in the *Tools of Today* section of THE TOOL ENGINEER. To obtain complete information on any of these products, circle the corresponding key numbers on this coupon, and mail the coupon to THE TOOL ENGINEER.

Tools of Today Department, THE TOOL ENGINEER
550 West Lafayette Blvd., Detroit 26, Michigan

Gentlemen:

Please send me further information on the following Tools of Today items which I have checked:

T-3-1 T-3-2 T-3-3 T-3-4 T-3-5 T-3-6 T-3-7 T-3-8 T-3-9
T-3-10 T-3-11 T-3-12 T-3-13 T-3-14 T-3-15 T-3-16 T-3-17 T-3-18
T-3-19 T-3-20 T-3-21 T-3-22 T-3-23 T-3-24 T-3-25 T-3-26 T-3-27
T-3-28 T-3-29 T-3-30 T-3-31 T-3-32 T-3-33 T-3-34

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Centerless Blades

TALIDE METAL MEETS EVERY REQUIREMENT

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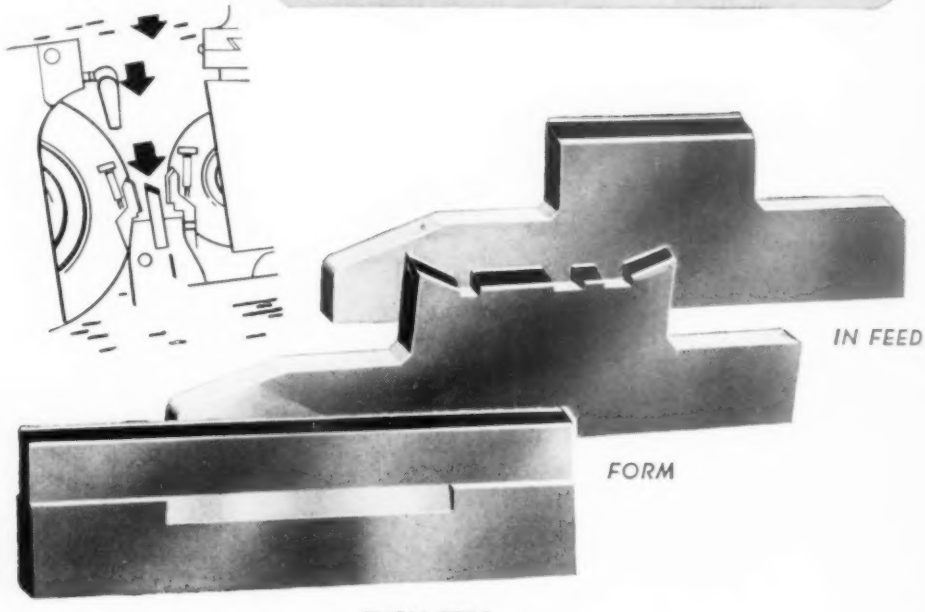

● **Talide Tungsten Carbide Blades outwear cast iron, tool steel or hard-faced blades by at least 25 to 1. On most applications, Talide stays on the job 50 to 75 times longer than other blades.**

This longer service life means continuous operation with the advantages of less scrap, less down time and lower unit cost. Remember, too, the Talide Carbide insert is a solid strip without sections or lines or seams to score the work. In addition to standard blades, we design and manufacture form or step blades for use in grinding parts with multiple diameters, steps, tapers, contours or other special shapes. ***Forward part or drawing for estimate.***

Talide Blades and other standard Talide products (tools, dies, etc.) are available from stock from the following warehouses:

Newark, N. J., 166 Bloomfield Ave.
Youngstown, Ohio, 107 E. Indianola Ave.
Detroit, Mich., 6432 Cass Ave.
Chicago, Ill., 601 W. Milwaukee Ave.

★ For the full story on longer service life of Talide Centerless Blades, ask for Catalog 48-WP, complete with prices, sizes and specifications.

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YOUNGSTOWN 5, OHIO *Pioneers in Tungsten Carbide Metallurgy*

CUTTING TOOLS · DRAWING DIES · WEAR RESISTANT PARTS

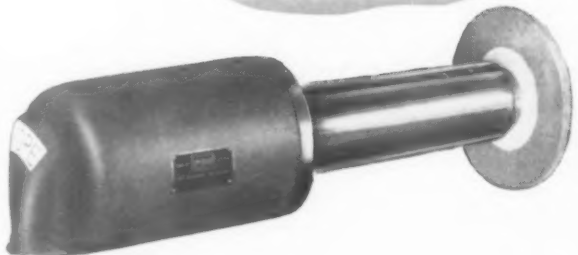
POPE

Sealed Package SPINDLES

The Spindles pictured are among the most popular and widely used of the many Pope *Sealed Package* Spindles.

These Spindles assure you:

Continuous Production of High Quality
Cool Operation at High Speeds
Sealed Lubrication Performance
— no oiling or greasing, nothing to renew, replace or adjust throughout the entire life of the bearings.



"P-32T

This new P-32T 6" x 18" Surface Grinder Spindle is a complete Sealed Package. It has a full 1 H.P., 3450 RPM totally enclosed motor. It is the outstanding spindle for surface grinding. Ask for the Pope Sealed Package Spindle, *P-32T.*

"P-1004

This Pope Tool Grinder Spindle is equipped with 1 H.P., 3450 RPM totally enclosed motor; for grinding wheels up to 8" O.D., ¾" face, 1¼" hole. *Sealed* Lubrication. Ask for *P-1004.*

"P-2500

This Pope Heavy Duty Spindle with totally enclosed fan cooled motor is ideal for surface grinding. It can be mounted on planers and boring mills. It comes in a variety of sizes from ¾ to 20 H.P. and from 900 to 3600 RPM. *Sealed* Lubrication. Ask for *P-2500.*

"P-666

This Pope Heavy Duty Vee Belt Driven Wheel Head Spindle takes grinding wheels from 6" to 36" diameter. Maximum speed 4000 RPM. Ask for *P-666.*

No. 58

POPE

TRADE MARK REG. U.S. PAT. OFF.

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BUILDERS OF PRECISION SPINDLES

THESE *Extra*

at No Extra Cost . . . IN OILGEAR BROACHING MACHINES

Ever since Oilgear pioneered fluid power broaching many years ago, Oilgear has constantly sought to anticipate new needs in the broaching art . . . in order that this versatile tool might be made progressively better and more productive. Today, Oilgear Broaching Machines incorporate, as *STANDARD*, many features not furnished in other machines or only available at extra cost.

FEATURES OF OILGEAR ELECTRO-HYDRAULIC CONTROLS

(The product of Oilgear's superior design and engineering)

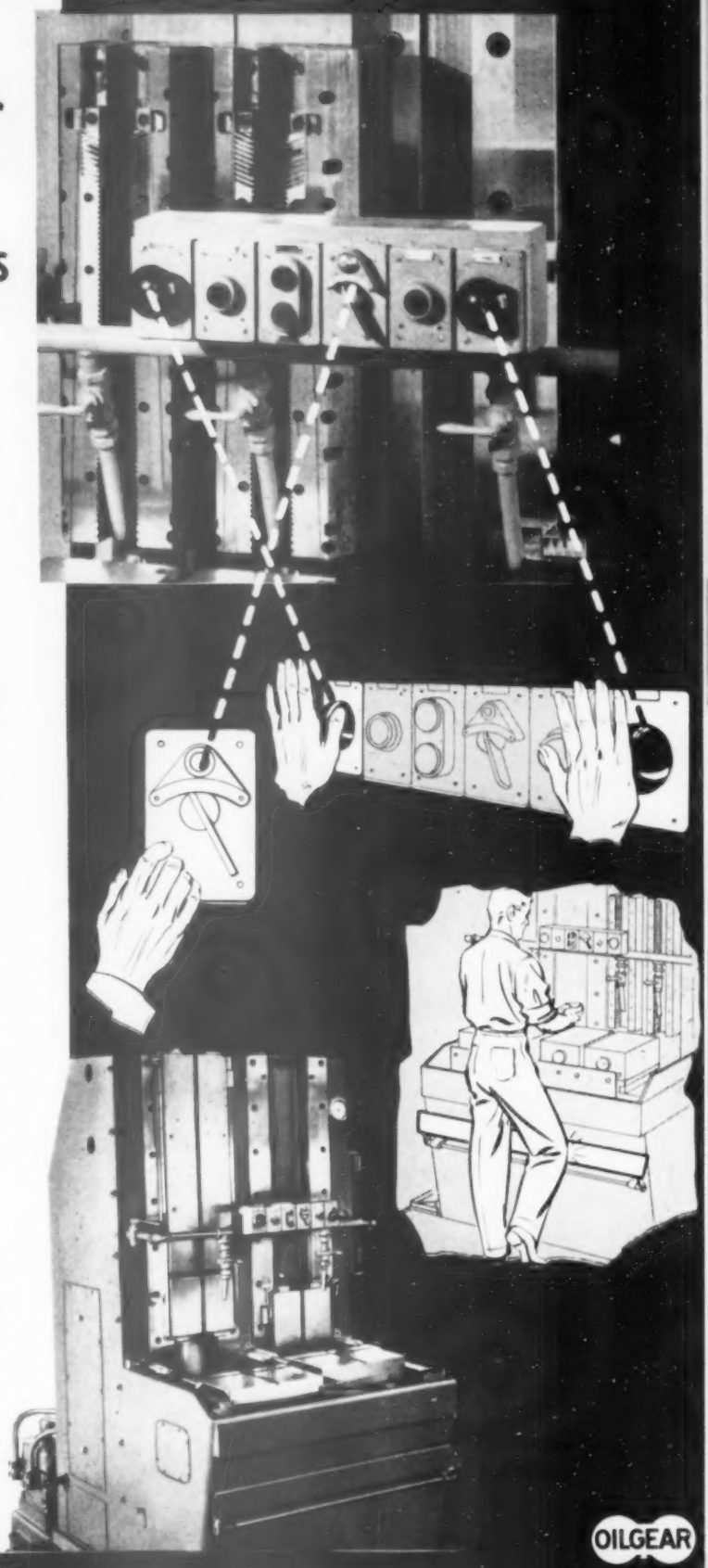
CYCLE SELECTOR. Manual push-button, semi-automatic or full-automatic operation is selected quickly with ease through a nearby switch. There are no pilot and sequence valves and load and fire mechanisms to reset or cause trouble. Selector switch can be locked to prevent tampering by operator and damage to tools and fixtures.

SAFE CONTROL. Dual push-buttons protect operator against accidental starting of machine. Safe starting of broaching cycles is simple. There are no control levers, links, springs and valves to require overtravel, tire the operator and reduce production. Response to controls is instantaneous and positive; there's no needless, time-taking overtravel of tool.

EMERGENCY STOP. Operator can stop machine instantly at any point in cycle with emergency push-button or knee bar. There's no bending or balancing on one foot to depress a pedal or struggle to shift a lever. It's another factor of safety for operator and machine.

PROTECTED SWITCHES. Limit switches are mounted inside machine; protected from cutting fluid, chips, shop dust and other causes of damage. Relays are concealed in control panel on side of frame for easy inspection.

These are only a few of the many exclusive features of Oilgear Fluid Power Variable Speed Broaching Machines. Write for complete descriptive bulletins. THE OILGEAR COMPANY, 1573 W. Pierce St., Milwaukee 4, Wisconsin.

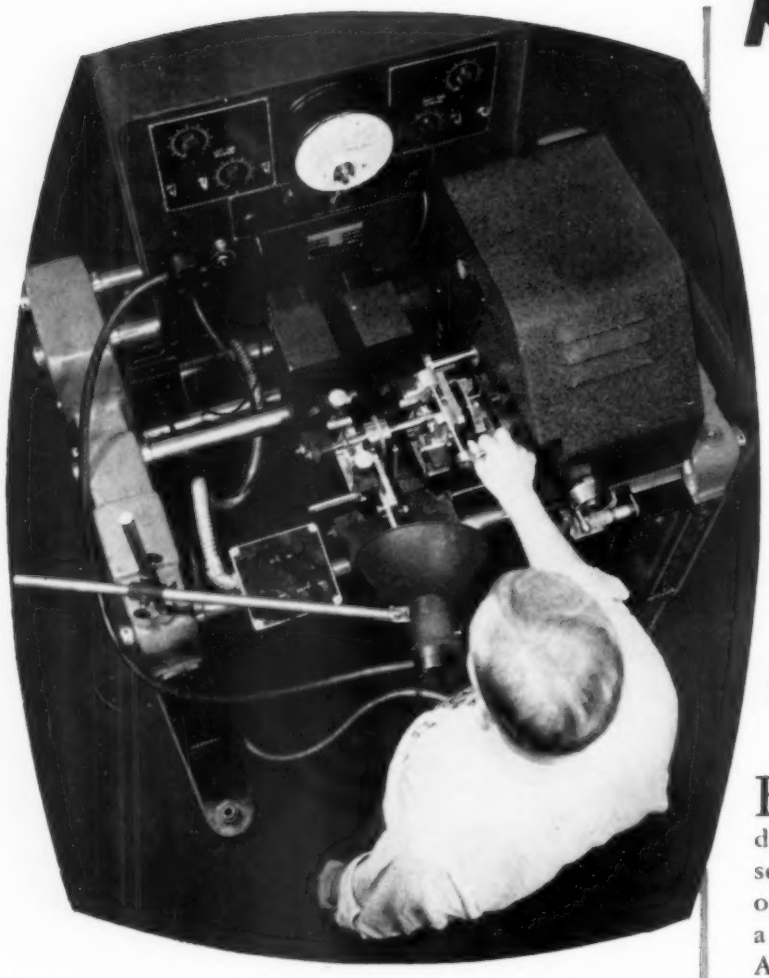


OILGEAR

Oilgear Fluid Power

1 MACHINE handles all 3 STEPS

of the complete balancing process!



1 *Locates and measures the unbalance*

2 *Corrects the unbalance*

3 *Inspects for over-all accuracy*

at the rate of 100 PIECES PER HOUR!

Balancing these fans for vacuum sweepers is now done completely on *one* machine. It takes only a few seconds to locate and measure the unbalance. Then, the operator turns the piece to the proper angle and turns a hand-wheel to correspond with the meter reading. At the press of a button, a fly-cutter removes the exact amount of metal to bring the part into balance. The part may be rechecked if desired.

The inclusion of correction equipment indicates the modern trend in balancing with Gisholt DYNETRIC Balancers. It saves handling—only one loading is required to complete all three steps.

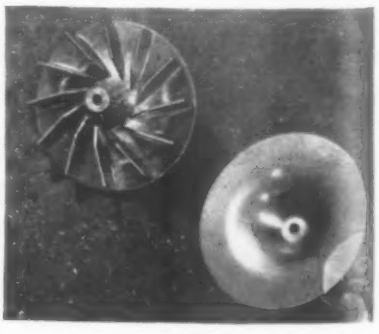
Those who are concerned with balancing of rotating parts have learned that it's wise to specify Gisholt.

DYNETRIC BALANCERS — GISHOLT — DEVELOPED JOINTLY WITH WESTINGHOUSE ELECTRIC CORPORATION. "DYNETRIC" IS A TRADE MARK REG. U. S. PAT. OFFICE BY WESTINGHOUSE ELECTRIC CORPORATION

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

THE GISHOLT ROUND TABLE represents the collective experience of specialists in the machining, surface finishing, and balancing of round and partly round parts. Your problems are welcomed here.



Showing front and back of fan with metal removed to correct unbalance. The entire balancing operation required an average of less than 45 seconds per piece.

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SUPERFINISHERS • SPECIAL MACHINES

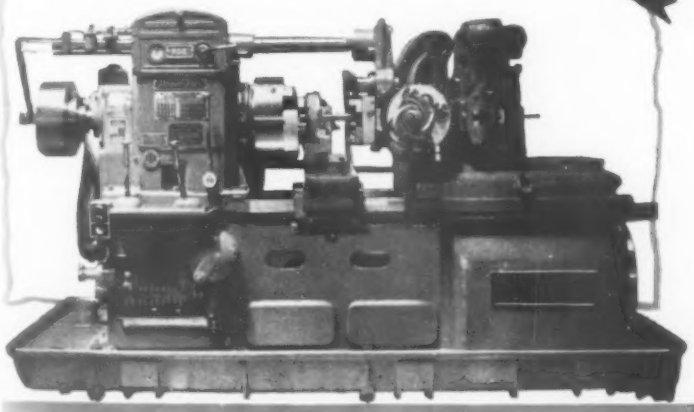
A 5 MINUTE JOB

WHEN IT'S DONE ON A P&J 5DE WITH P&J TOOLING

The finest Automatic Turret Lathe built — one like the Potter & Johnston 5DE, for example — is no better for a given job than the tooling that's applied to that job.

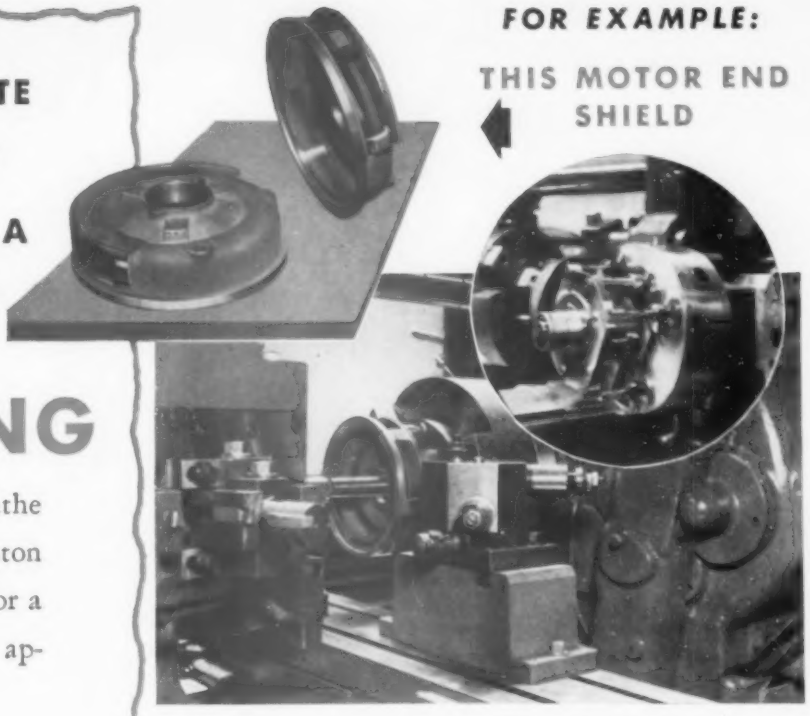
Potter & Johnston Tooling Engineers have the experience and the ingenuity to work out the one best combination and sequence of machining operations for high speed, high precision, low cost parts production.

It will pay you to send parts or prints to P&J for recommendations and estimates. Seeing what we can do puts you under no obligation and may point the way to production gains and savings of substantial importance.



FOR EXAMPLE:

THIS MOTOR END SHIELD



P&J TOOLED FOR THESE SUCCESSIVE OPERATIONS:

Closed side to spindle . . . gripped by 3 jaw chuck.

1st T.F.: Rough bore hole; rough turn O.D.; rough bore two dias.; machine dovetail groove in O.D.

2nd T.F.: Straddle face small hub; rough face bottom of counterbore; rough face end.

3rd T.F.: Finish bore hole; finish turn O.D.; finish bore counterbore; chamfer.

4th T.F.: Finish straddle face small hub; finish face bottom of counterbore; finish face end.

5th T.F.: Drill 6 small holes.

Inset pictures the P&J multiple drilling setup on 5th T.F., an exclusive P&J feature that saves a lot of time and trouble.

All done in 5 minutes on this P&J 5DE Automatic Turret Lathe: a powerful, rigid production unit with 20 changes of speed, arranged in five sets of four automatic changes; 24 feeds arranged in geometric progression; automatic binding of turret following index; direct cross slide action and constant high speed traverse motion to cross slide and turret slide. Write for Bulletin giving complete specifications.

5DE AUTOMATIC TURRET LATHE

Potter & Johnston Company

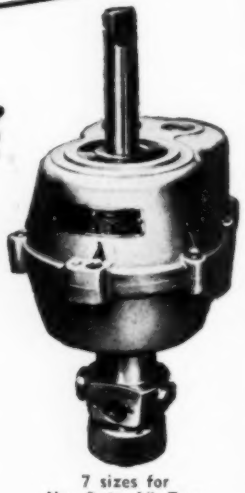
Pawtucket, R. I.

subsidiary of Pratt & Whitney Division Niles-Bement-Pond Company

P&J

TOOL UP FOR THRIFTY TAPPING and THREADING

Ettco-Emrick TAPPERS



7 sizes for No. 0 to 1" Taps

attached to your drill press spindle offer a low-cost way to tool up any drill press for a wide range of tapping needs. Hair-trigger sensitive clutch protects taps and work. Ettco Tappers are ideal where cost, production and accuracy are important factors. Quill clamps are available for maximum rigidity.

5 sizes for No. 6 to $\frac{5}{8}$" dies

Ettco-Emrick THREADERS

are standard Ettco Tappers fitted with acorn or button-type die-holders and dies. They put threading work on a high-speed production basis. Their highly sensitive action assures accurate, low-cost work.

WRITE FOR BULLETIN 22

It gives details and prices on Ettco-Emrick Tappers and Threaders, which are available at leading mill supply houses throughout the country.

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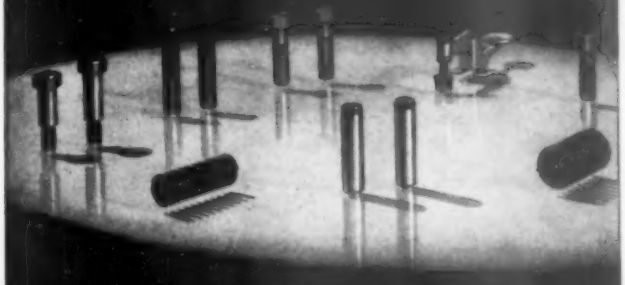

These assembly items are known throughout industry for their quality and precision.

For quick service draw on our large stock of Dowel Pins (163 Standard sizes plus oversizes), Springs, Socket Head Cap Screws, Stripper Bolts, Set Screws and Toggle Clamps.

Standard and Special Die Sets in all sizes.

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DETROIT DIE SETS ★

men who know tool materials ask for V-R first ?

BECAUSE . . . in addition to obtaining the finest carbide made, they obtain on-the-job Tool Engineering Service. This V-R Tool Engineering Service is outstanding because every V-R Field Engineer is free to recommend not just carbide but — either carbide or cast alloy, or briefly, the right tool material for every shop need.

The Vascoloy-Ramet Corporation has been producing both V-R carbide and Tantung cast alloy tools for 18 years. It is this tremendous background in both carbide and cast alloy manufacturing experience that is available to every user of metal cutting tools.

For the maximum in tool performance your "best bet is Vascoloy-Ramet" today.

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Your V-R Branch Office or Distributor NOW!

Send for your copy of the new V-R Bulldog Toolholder Catalog — Write today for Catalog No. 430-E; containing a complete line of Carbide and Cast Alloy Toolholders.

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V-R CARBIDE and TANTUNG

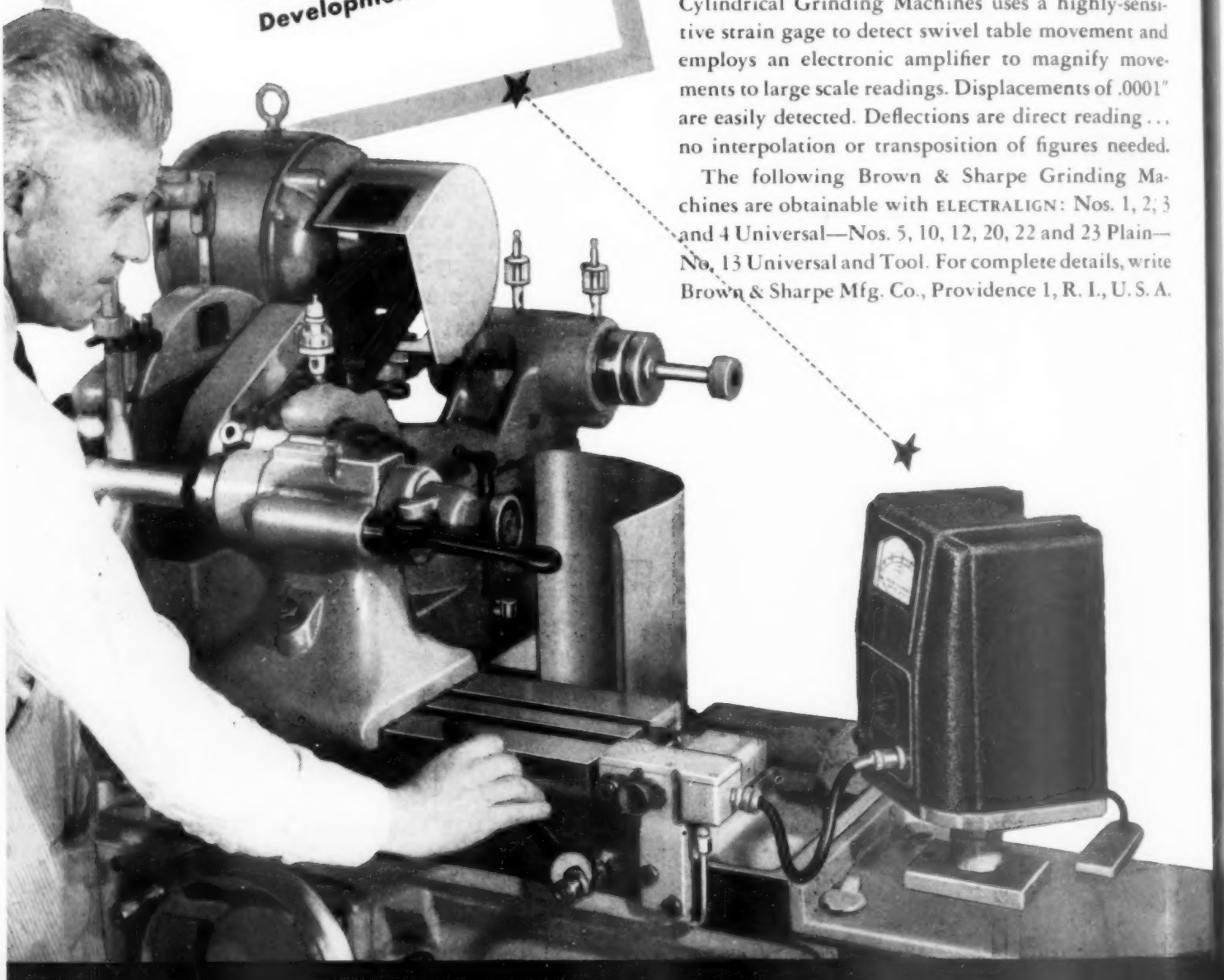
vascoloy-ramet corporation

WAUKEGAN • ILLINOIS

For the First Time! Electronic on

ELECTRALIGN

Exclusive New Brown & Sharpe Development



Here is a unique aid that permits grinding machine operators to accurately align a swivel table for straight or tapered work after only *one* preliminary grind. ELECTRALIGN, designed to transfer operator's skill to a function of the machine, eliminates costly time-consuming, cut-and-try operations. It does much to eliminate spoiled work, particularly where only .002" to .003" is left for finish grinding.

This exclusive arrangement for Brown & Sharpe Cylindrical Grinding Machines uses a highly-sensitive strain gage to detect swivel table movement and employs an electronic amplifier to magnify movements to large scale readings. Displacements of .0001" are easily detected. Deflections are direct reading . . . no interpolation or transposition of figures needed.

The following Brown & Sharpe Grinding Machines are obtainable with ELECTRALIGN: Nos. 1, 2, 3 and 4 Universal—Nos. 5, 10, 12, 20, 22 and 23 Plain—No. 13 Universal and Tool. For complete details, write Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

BROWN &

Alignment of Swivel Table Grinding Machines

ACCURATE SETTING EASILY MADE

The extreme simplicity and reliability in operation of the ELECTRALIGN makes it very practical for shop use. Corrections in swivel table alignment may be made simply and precisely. No need of regrinding several test pieces to obtain proper adjustment.

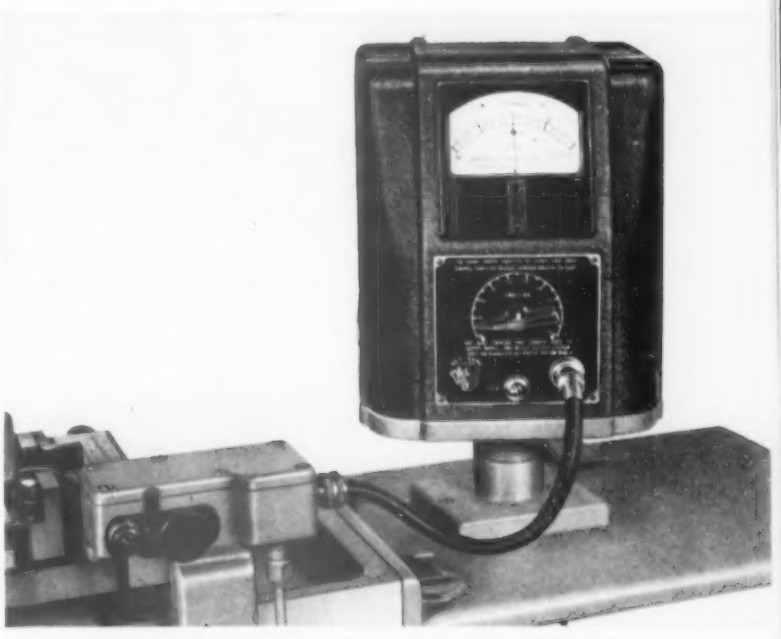
SET-UP TIME SHARPLY REDUCED

After ELECTRALIGN amplifier pointer has been set to the ten-thousandths desired to swing the work, the operator makes a single, positive correction by moving the table, through its regular adjusting mechanism, until the pointer reads zero. It's done in an instant! This correction can be made during the grinding operation.

EASIER OPERATION FASTER PRODUCTION

On long work ground to close limits, even a slight taper may represent a large part of the allowable tolerance. On this type of work, ELECTRALIGN makes setups easier and more positive . . . makes faster production possible . . . and reduces risk of spoilage. Tapers, too, can be set directly after one preliminary grind . . . and precise settings maintained.

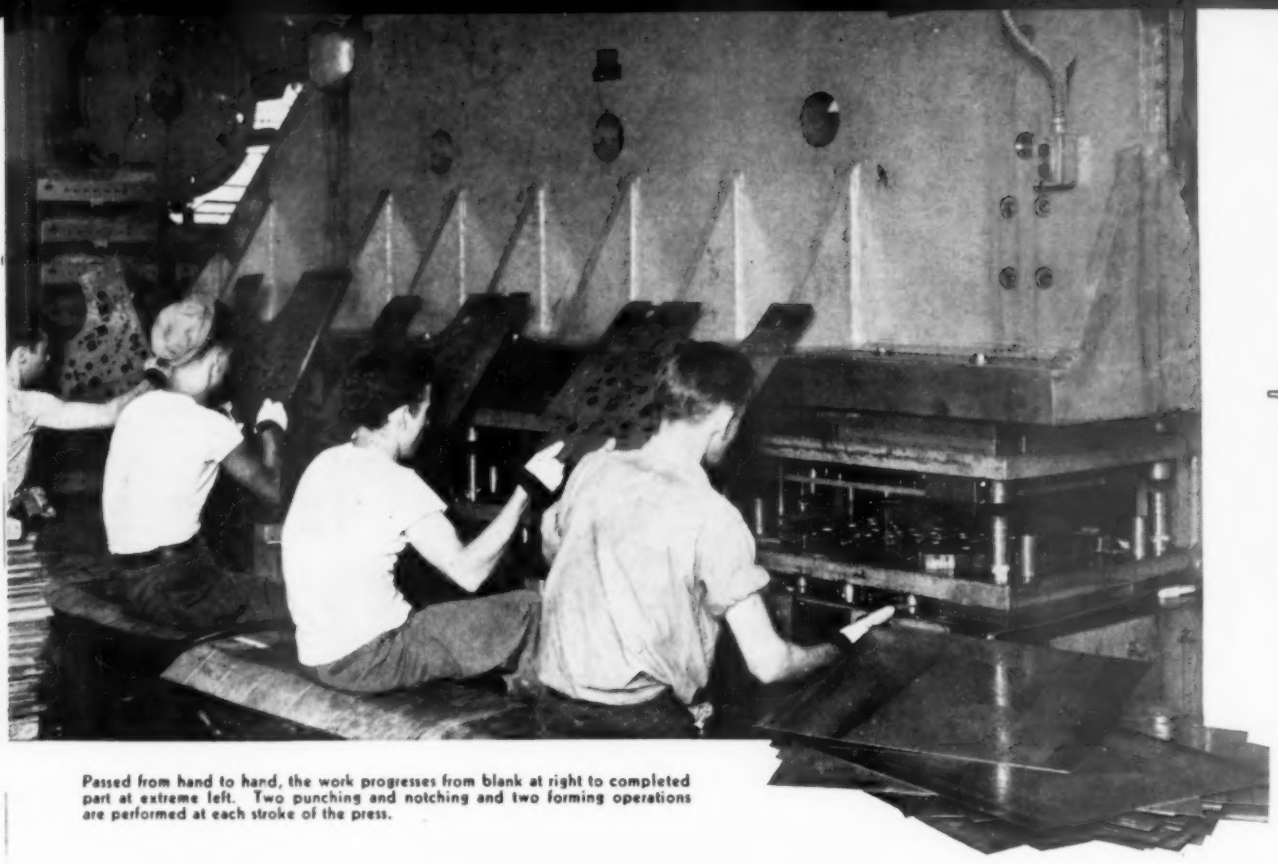
OTHER PRACTICAL ADVANTAGES — ELECTRALIGN may be supplemented by the Electralign-Comparator Selector when external or internal measurements employing a comparator are made in conjunction with setting the table for alignment. This equipment eliminates differences in measurement due to human "touch or feel" and a wide choice of comparators is possible.



Conveniently located Electralign Amplifier magnifies small angular swivel table movements to large scale readings.

Operator using Electralign-Comparator Selector with a special gage to check measurement of straight work. A wide variety of comparators may be adapted for use with this equipment.

SHARPE B·S



Passed from hand to hand, the work progresses from blank at right to completed part at extreme left. Two punching and notching and two forming operations are performed at each stroke of the press.

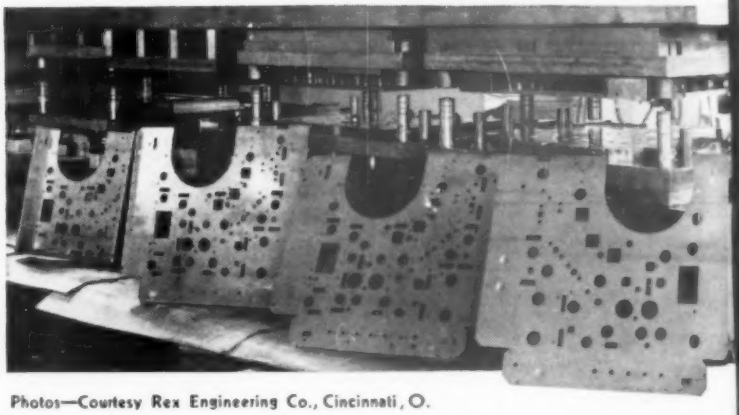
OPERATION TELEVISION...

This television chassis, a modern product made in the modern manner on a Cincinnati Press Brake, is produced from blank to completion in one stroke—four simultaneous operations on one machine.

281 holes, tabs and notches are punched, and three sides are formed at each stroke—to close tolerances.

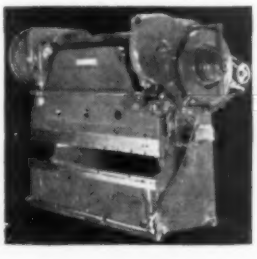
Cincinnati wide beds and rams—either fixed or detachable—for large area work, are highly productive on jobs of this kind.

You may find you can do it for less on a Cincinnati Press Brake.



Photos—Courtesy Rex Engineering Co., Cincinnati, O.

Write for technical Bulletin 165
a compact treatise on Press Brake
practice, dies and applications.



THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

67 chisel FOR SHOCK TOOLS

When tools and dies must take slam-bang shocks it's a job for 67 Chisel. This is a tool steel engineered for maximum shock-resistance. Toolmakers can rely on its capacity to withstand heavy, repeated impacts day after day, both on cold and hot work.

Cold-Work Applications: Cold-battering tools, chipping chisels, calking and beading tools, shear blades, punches, forming dies, cutting pliers. Carburized for extra wear-resistance, 67 Chisel is the first choice for master hobs used in cold-hobbing cavity molds. It is also recommended for tools having deep recesses, sharp corners, slender shanks—wherever great strength is needed.

This toolmaker is putting the finishing touches on a striking punch of 67 Chisel. Having a hardness of Rockwell C-58, this tool must withstand considerable shock in producing an automotive part on a 50-ton press.

Punch and two-piece die for forming parts from 1/16-in. steel strip. Toughness was required here, but the user reports satisfaction with 67 Chisel because of its long-wearing properties, easy machining, and overall economy in production.

Tolerance on dies is kept within .0005 in.

Hot-Work Applications: Headers, piercers, forming tools, inserts for drop-forge dies, heavy shear blades, and the like. Having a good red-hardness value, 67 Chisel has many hot-work applications where the operating temperatures of the tool are below 1050 F.

Outstanding Properties. 67 Chisel is easy to forge, machine, and heat-treat. Here are typical results with a ¾-in. bar, hardened at 1750 F and oil-quenched:

Temper, F	*Charpy, ft-lb*	*Rockwell C*	*Tensile, psi*
400 (for cold work)	180	56.5	315,000
1050 (for hot work)	200	47	230,000

	C	*Si*	*Cr*	*W*	*V*
Analysis.	0.50	0.75	1.15	2.50	0.20

Prompt Deliveries. 67 Chisel is available in many standard sizes at our mill depot. Also stocked by many of our tool steel distributors. Get full details from the nearest Bethlehem sales office. Better still, order a test bar and see for yourself how tough 67 Chisel really is!

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

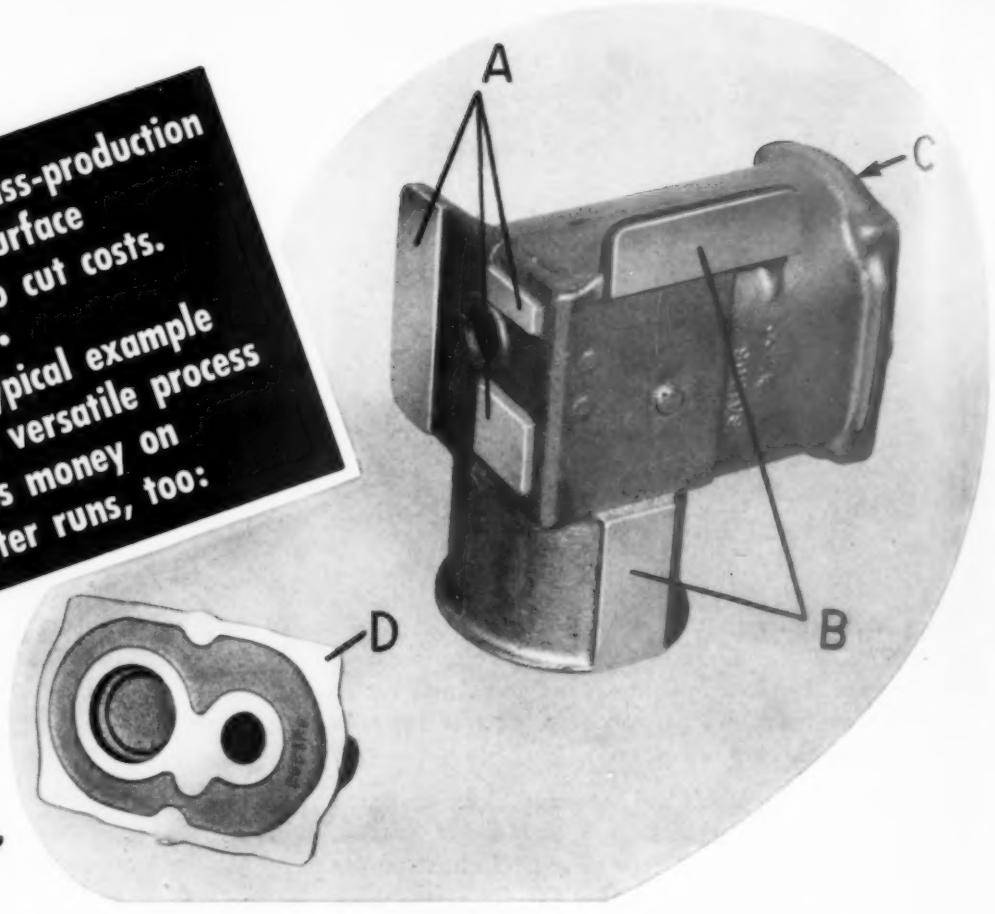
BETHLEHEM STEEL

67 Chisel . . . one of Bethlehem's Fine Tool Steels

You don't need mass-production to use surface broaching to cut costs.

•

Here's a typical example of how this versatile process saves money on shorter runs, too:



How to cut Machining costs on castings

Shown here are two of **three different castings** requiring the machining of **14 surfaces.** The 3rd casting is similar to the larger one.

All surfaces on all three castings are broached on just **one machine**—a Colonial Dual Ram—with a total of **only two broaches,** one for each ram.

Sure a setup like that cuts costs:

Machining time per face is measured in seconds instead of minutes;

One ram returns and is being loaded while the other is cutting;

Tools have to be removed only rarely for sharpening;

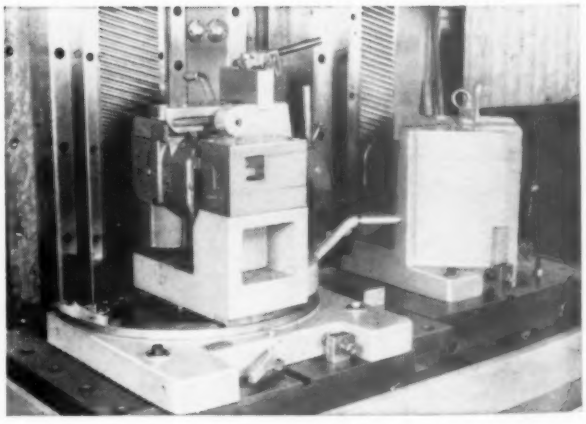
A simple fixture index eliminates extra set-ups;

Tolerances are accurately and automatically held;

In-and-out shuttling of the fixtures is automatic;

Adjusting screws on fixtures allow for unusual stock variations.

Of course your jobs may require a different type of surface broaching set-up—say on a Single Ram machine (with one broach); or on a Universal Horizontal. Regardless of the best machine type, the odds are Colonial can show you some real savings on machining of castings. We will welcome the opportunity.



What would you like to know about broaching? Drop us a line. We'll be glad to help . . .

PIONEERS OF H.S.S. BROACHING

COLONIAL

BROACH CO. DETROIT 13

Presenting

THE NEW LUFKIN "CHROME CLAD" MICROMETER—with Non-Glare Satin Finish

Lufkin adds another important feature to the many which now distinguish its famous Micrometers,—"Chrome Clad", Non-Glare Satin Finish. Utilizing recent pacesetting developments in metal finishing, Lufkin now applies a heavy chrome plating to its micrometers. This finish *possesses a non-glare quality which makes reading easier than ever before.* You get your reading at a glance in bright or poor light. Markings stand out sharp and bold against the satin finish. It is rust and wear resistant. Here's a real ally for the precision worker to whom accuracy is a "must". Ask your dealer to show you the seven superior features of this improved precision tool.

7 SUPERIOR FEATURES

***"Chrome Clad", Non-Glare Satin Finish, Easy to Read, Rust and Wear Resistant • Hardened Ground Thread • Easy Adjustment • One Piece Spindle • Cutaway Frame • "Rapid Reading", (Each Thousandth Numbered) • Micro-Lapped Mirror-Like Finish on Anvil and Spindle Ends.**

*Before releasing Lufkin Chrome Clad Micrometers to the public they were used for several years in our own plant on various types of rough and finished metal working production. All micrometers tested have retained their non-glare satin finish to our complete satisfaction.

PRECISION TOOLS LUFKIN TAPES • RULES

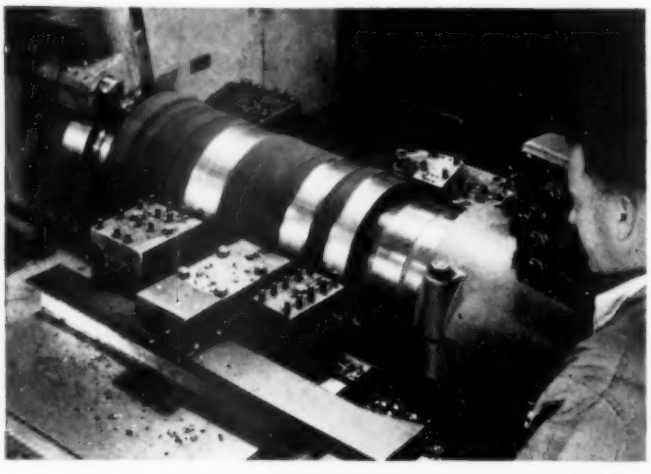
Accuracy of Measurement is the Key to Precision

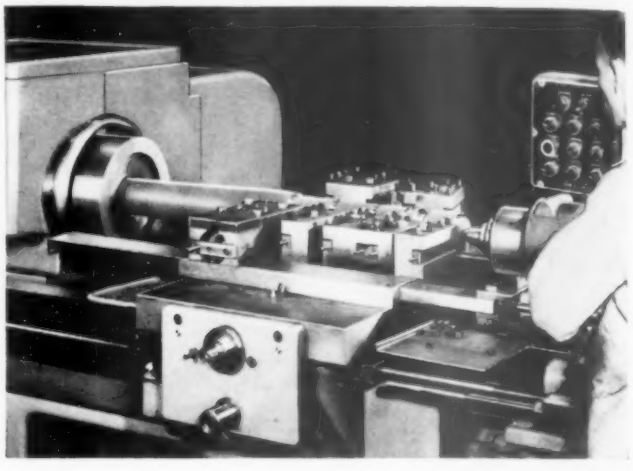
THE LUFKIN RULE COMPANY • SAGINAW, MICHIGAN

Heavy Turning Jobs...

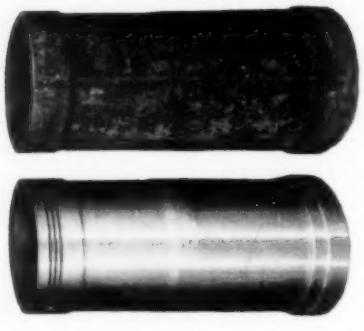
On SUNDSTRAND Multiple Tooled 75 H.P. Automatic Lathes

If you have large work requiring turning and heavy stock removal, here's the lathe for the job. This heavy duty automatic lathe (17" swing over slides) has the same highly productive features of all Sundstrand Automatic Lathes . . . quick cycle changeover, simplicity in adjustments, wide range of carriage cycles and feeds and speeds together with a high rapid traverse rate. *In addition, a 75 horsepower spindle motor* provides ample power for heavy cuts and carbide cutting tools. Here are a few examples of heavy turning jobs done on the Sundstrand Model 16. If you have similar work, call in a Sundstrand engineer.





66 Hours Saved Turning Lot of 20 Cylinder Liners



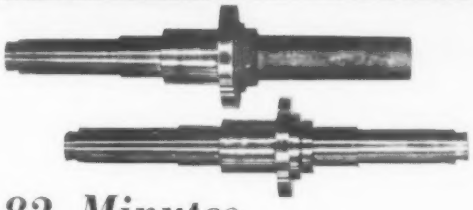
Liners are 32" long by 15¼" diameter and are processed in lots of 20 pieces. With old machines and method, roughing time was 60 hours for 20 pieces. Sundstrand multiple tooled Model 16 rough turns same number of parts in only 10 hours. Tooling is then changed for finish turning. Five different diameters, three .253" grooves in the O.D. and an additional groove in the end wall diameter are completed in this operation. Finish turning time was cut from 24 hours to 8 hours. Part illustrations show rough and finish turned cylinders.

300% Production Increase On Heavy Tractor Shafts

This tractor shaft is a steel forging (285 Brinell). It is rough turned, faced and formed complete in two operations on a Sundstrand Model 16 Automatic Lathe. Lot size is 350 pieces. First operation tooling shown above has nine carbide tipped tools. Maximum depth of cut is ⅞" — HP consumed at peak load is 79. Over 18 pounds of metal is removed per minute. Production on the Sundstrand is over 5 per hour compared to 1¾ by the former method. Here is a good example of the use of multiple tooling and an automatic cycling 75 HP Sundstrand Model 16 Lathe for improving turning production.

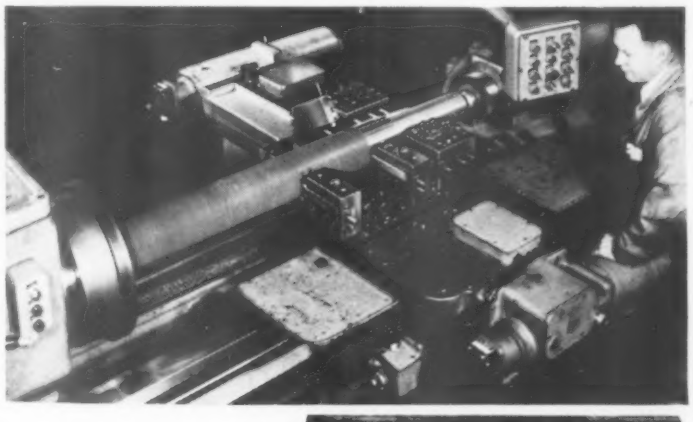
SUNDSTRAND MACHINE TOOL CO. · ROCKFORD, ILLINOIS, U.S.A. ·

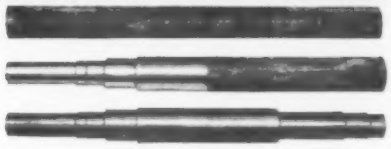
RIGIDMILS • FLUID-SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT



Turning Time Cut From 23.7 to 3.82 Minutes

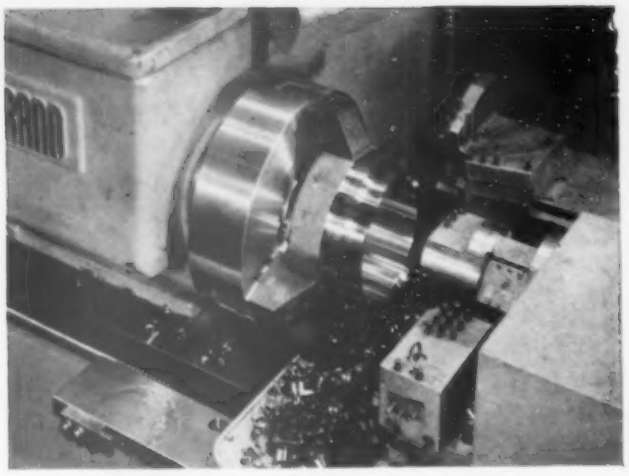
This track sprocket shaft is 1045 steel forging with a hardness of 212 Brinell. It is completely turned in two set-ups on a Sundstrand 75 HP Model 16 Automatic Lathe which has ample power to make full use of multiple tooling and carbide tipped tools. The first operation which is illustrated above is rough turning, facing and forming one end with nine tools. H.P. consumed at peak load is 84 — maximum depth of cut is 7/8". Production on the Sundstrand is 8 shafts per hour compared to 1.6 shafts by the former method. Here is another good example of the fast metal removal possibilities of the Sundstrand Model 16 Automatic Lathe.





85 lbs. of Steel Removed in 9 Minutes

The generator shaft shown above is 63 inches long and is of 1045 steel bar stock. It requires the turning of five diameters on one end, four on the other. One end of a lot is turned in first operation, then shaft is reversed, tools re-set and opposite end turned in second operation. The generator shaft is only one of over 30 different shaft parts run on the Model 16 Automatic Lathe.



Turning, Facing, Boring and Chamfering Gear Assemblies

These split gear assemblies are machined in two operations. In the first, the part is chucked on the rough O.D. One-half of O.D. is then turned together with boring, facing and chamfering operations on one end. Part is then reversed and same operations performed on opposite end. Material is an extremely hard alloy steel of 400 Brinell. Speed is 366 S.F.P.M. — maximum depth of cut is 5/8" — production is 10 per hour for each operation.

FREE

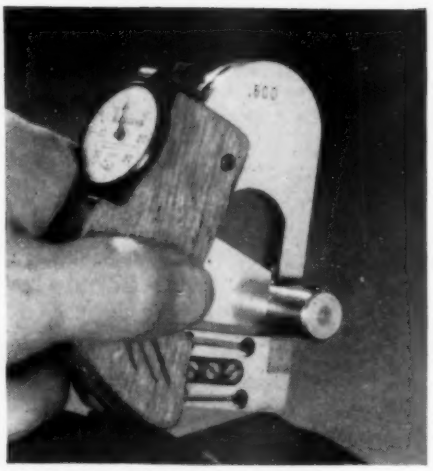
Additional Data

How you can save time on turning large parts is further explained in this free folder covering engineering data and specifications on the 75 horsepower Sundstrand Automatic Lathe. Write for your copy today. Ask for bulletin 781

SUNDSTRAND
MACHINE TOOL COMPANY
2540 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES

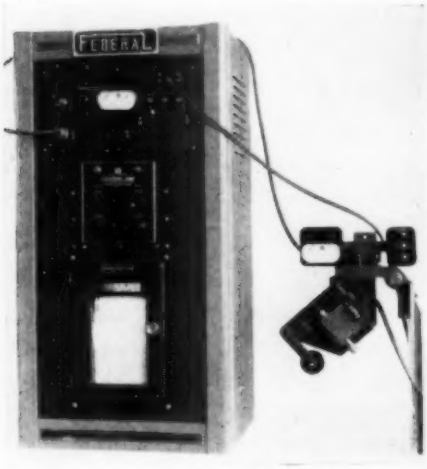
DIAL INDICATORS — Fast, positive visibility. Every size, graduation, range and type — accurate, dependable, adaptable.



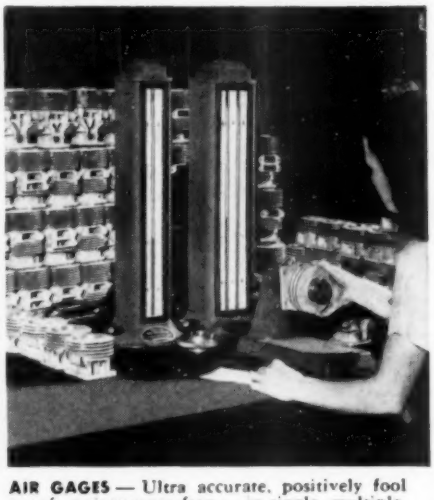
DIAL INDICATOR GAGES — Model 1340 Snap Gage — one of 65 catalog gages. Greatest variety by any gage manufacturer.

SPECIAL GAGES — One of over 10,000 specially designed gages. We build single and multiple purpose gages to meet your requirements.

ELECTRONIC-AUTOMATIC SORTING — The ultimate in 100% gaging — fast, stable, accurate. Engineered to your product.



CONTINUOUS MEASURING—Four basic types — adaptable to all kinds of materials and conditions.



AIR GAGES — Ultra accurate, positively fool proof, maintenance-free — in single, multiple, and special designs.

Are YOU the one who doesn't know

FEDERAL makes every type of Indicating Gage?

Wide, continuous experience gave us the know-how to design gages that produce better quality at lower cost.

YOU may know that Federal makes more Dial Indicators and Dial Gages than any other manufacturer. But, note this too—the entire Federal Plant is devoted exclusively to the design and production of *every type* of Indicating Precision Instrument by the latest scientific methods.

We engineer and make Automatic Sorting Gages, Signal and Automatic Control Gages, Continuous Measuring Gages in great variety to control dimensional accuracy as wanted.

We have made gaging devices for controlling the dimensions of every sort of article from wire staples to railroad splice bars, from sausage skins to jet engines; gages that do jobs people said couldn't be done.

Take advantage of the practical savings secured from these gages. The proper gage, properly applied, costs nothing. It collects money on saved scrap and eliminated operations.

For data on any of these gages write to Gaging Headquarters — Federal Products Corporation 1104 Eddy St., Providence 1, R. I.

FEDERAL

PRECISION MEASURING INSTRUMENTS

DIAL INDICATORS • INDICATING GAGES • SPECIAL GAGES • ELECTRONIC AND AUTOMATIC SORTING GAGES • AIR GAGES

Scratchless Stampings

Produced from 24-Gage Pre-Coated Stock

using DANLY Precision Die Set

Danly Precision Steel Die Set with dies used to blank and draw 14⅜" x 8" pan from 24-gage *pre-coated* lithographed cold rolled steel. Forming and curling are handled as secondary operations.

Drawing, blanking, forming and curling operations performed without marring satin-like finish

Here's an example of fine craftsmanship which is typical of the manufacturing methods employed by J. L. Clark Mfg. Co., Rockford, Ill. . . . producers of high quality lithographed steel ware.

Without marring or scratching the satin-like finish of pre-coated lithographed stock, the die illustrated blanks the center and produces an unusually smooth draw on this 24-gage steel pan. In a similar manner the edges are formed and curled in secondary operations.

Accurate punch and die relationship required

To assure accurate set-ups and precision results throughout, Danly 2-Post Precision Steel Die Sets are used, which are accurately machined top and bottom and equipped with leader pins and bushings lapped and honed to Danly precision standards. Because accurate punch and die relationship is maintained, full advantage is taken of the die makers' precision. The results are more stampings per grind, better product quality, and lower production costs.

Write for this *free* bulletin

Illustrates how you can use Danly's unusual machining service for special die sets to effect substantial savings in time and money.

save time — USE DANLY NATION-WIDE DIE SET ASSEMBLY SERVICE

Use Danly's specialized service to save time and money. Assembly plants listed below (marked with stars) stock interchangeable parts for quick assembly and delivery of any standard die set to suit your specifications.

- ★ **Chicago 50,** 2100 S. 52nd Ave.
- ★ **Cleveland 14,** 1550 E. 33rd St.
- ★ **Dayton 2,** 990 E. Monument Ave.
- ★ **Detroit 16,** 1549 Temple Ave.
- ★ **Grand Rapids,** 113 Michigan St., N.W.
- ★ **Long Island City 1,** 47-28 37th St.
- ★ **Los Angeles 54,** Ducommun Metals & Supply Co., 4890 S. Alameda
- ★ **Milwaukee 2,** 111 E. Wisconsin Ave.
- ★ **Philadelphia 44,** 18 W. Chelten Ave.
- ★ **Rochester 4,** 16 Commercial St.

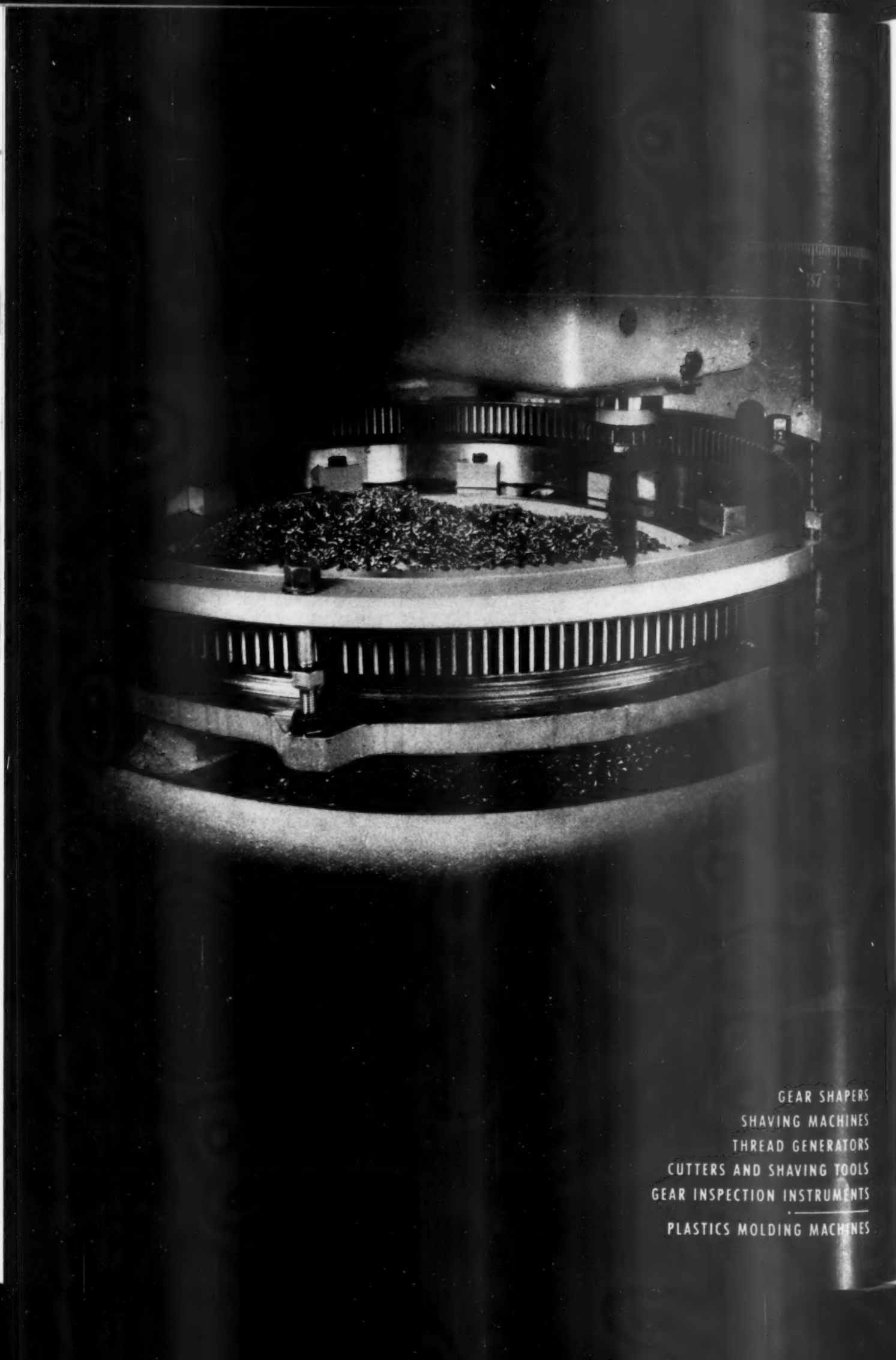
DANLY

DANLY MACHINE SPECIALTIES, INC.

2200 SOUTH 52ND AVENUE, CHICAGO 50, ILLINOIS

25 YEARS OF DEPENDABLE SERVICE TO THE STAMPING INDUSTRY

PRECISION DIE SETS...STANDARD AND SPECIAL • MECHANICAL PRESSES AND PRESS EQUIPMENT



GEAR SHAPERS
SHAVING MACHINES
THREAD GENERATORS
CUTTERS AND SHAVING TOOLS
GEAR INSPECTION INSTRUMENTS

PLASTICS MOLDING MACHINES

New Mastery of Costs on BIG GEARS

Here is a new Fellows machine . . . the 36-inch Gear Shaper . . . the rigid construction of which permits the taking of heavier cuts that set a new production pace, and a new and lower standard of costs in gear cutting.

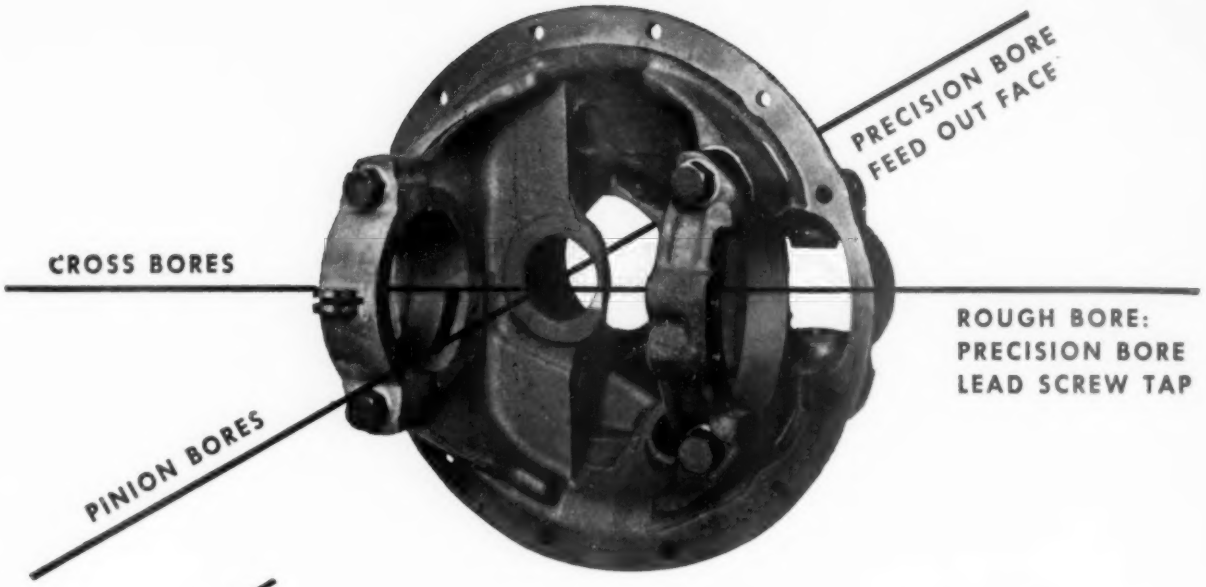
A case in point is the large combined external and internal gear illustrated. Feeds as high as .0225" per stroke at 58 strokes per minute prove the ability of this machine to take fast, heavy, roughing cuts. A study of the tabulation below should whet the interest of those seeking to lower their costs in gear cutting.

	External Gear	Internal Gear
Material	SAE 3250 52 R-C	SAE 3250 52 R-C
Pitch diameter (inches)	37.166	34.666
No. of teeth	223	208
Diametral pitch	6	6
Pressure angle	20°	20°
Face width (inches)	2¼	1¾
Roughing cut (58 strokes per min.)	.0225" per stroke	.0225" per stroke
Finish cut (58 strokes per min.)	.027" per stroke	.027" per stroke (58 STROKES PER MINUTE)
TOTAL PRODUCTION TIME	2 hrs. 48 min. 45 sec.	2 hrs. 15 min.

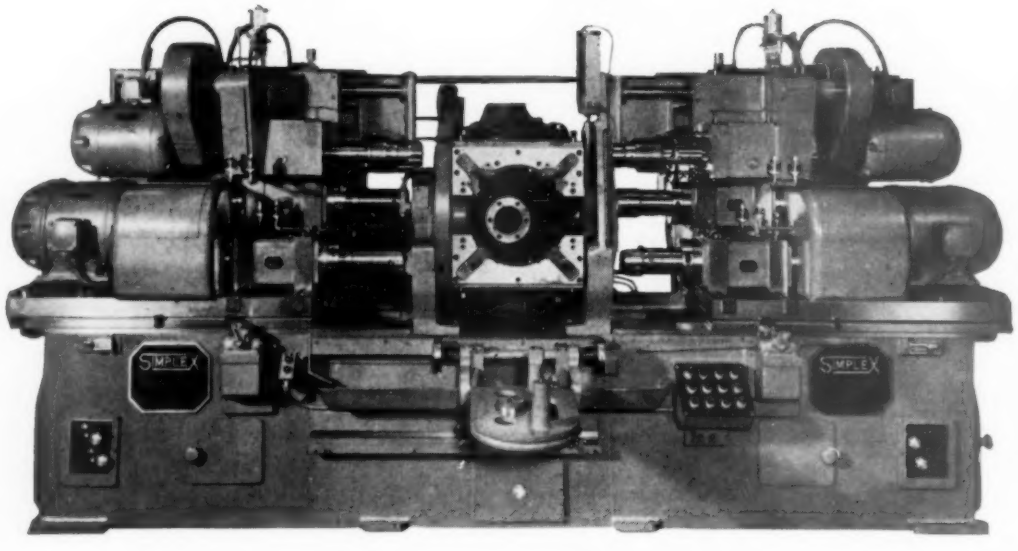
We have even more data to offer in evidence of the remarkable production possibilities of the 36-inch Gear Shaper. Call or write our nearest office.

Fellows

THE FELLOWS GEAR SHAPER COMPANY • Head Office and Export Department • 78 River Street, Springfield, Vermont.
Branch Offices: 616 Fisher Bldg., Detroit 2 • 640 West Town Office Bldg., Chicago 12 • 7706 Empire State Bldg., New York 1.



MARKS THE SPOT WHERE *Precision Pays Off*



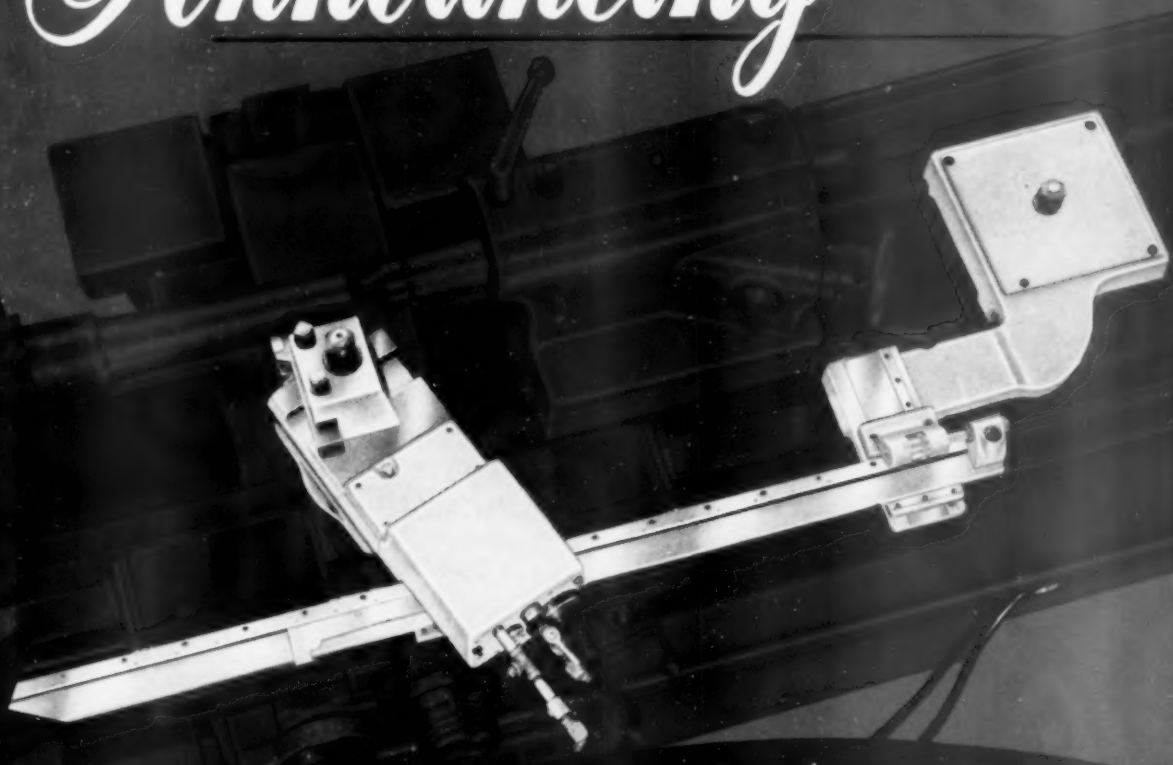
A Prominent Manufacturer of Axles greatly increased production, practically eliminated Axle tear down after assembly and lowered costs with these SIMPLEX 3-way Precision Boring Machines. A four-position indexing fixture permits loading on Station No. 1; Rough Boring Cross Bores on Station No. 2; Precision Boring Cross Bores, Pinion Bore and Feed Out Facing Pinion Bore on Station No. 3; Lead Screw Taping of Cross Bores on Station No. 4. A Production of 40 Carriers per Hour has been achieved on this large Truck type differential Carrier. Smaller Car Carriers would permit considerably higher production rates.

Simplex **PRECISION BORING MACHINES**

SIMPLEX MACHINE TOOL DIVISION
STOKERUNIT CORPORATION
4528 WEST MITCHELL STREET
MILWAUKEE, WISCONSIN

PRECISION BORING MACHINES • PLANER TYPE MILLING MACHINES • SPECIAL MACHINE TOOLS

Announcing



the new LeBlond Hydra-Trace Attachment for any LeBlond Heavy Duty lathe...

HYDRA-TRACE SIMPLICITY: Only 5 parts are required, thus simplifying operation, mounting and unmounting. 1. Tracer slide, 2. Template, 3. Template carrier, 4. Bed bracket, 5. Hydraulic tank and pump.

Hydra-Trace gives you
better, faster automatic duplicating
and here are 12 reasons why:

1. The new Hydra-Trace, a simple, heavy duty compound rest unit, performs practically all operations of form turning, contour facing, and step shafts.

2. It can be applied quickly and without any drilling or fitting to all LeBlond heavy duty engine lathes 12" to 50" sizes, the RT Series tool room and engine lathes, the plain and sliding bed gap lathes, and to the Rapid Production lathes.

3. Does not interfere with or limit cross travel. Your regular lathe operator can handle it without complications.

4. Diameters are adjustable by means of regular cross feed screw.

5. Makes available the full swing and center distance capacity of lathe.

6. It's mounted on special compound rest which is interchangeable with regular compound in a matter of minutes.

7. Hydra-Trace is sold as an attachment . . . you don't have to buy a complete lathe. You can use it on any identical size LeBlond lathe built since 1935.

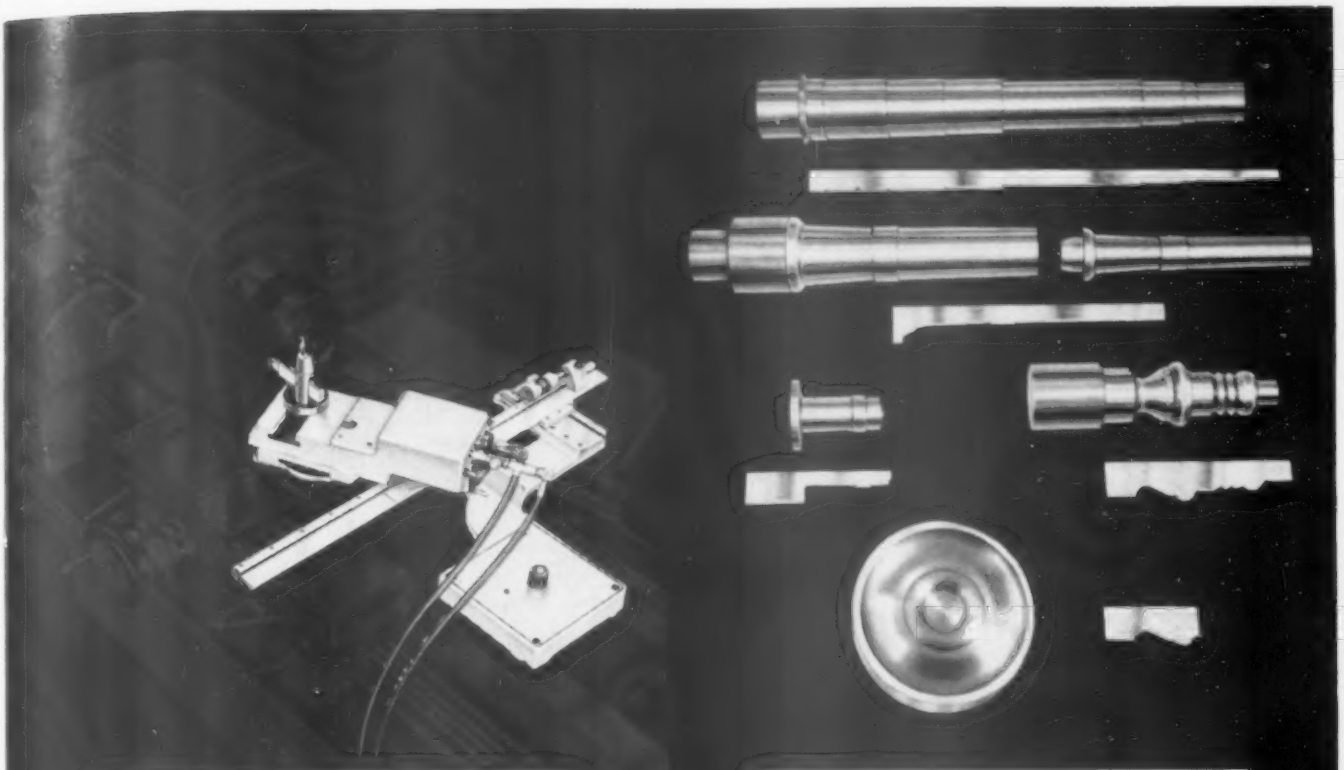
8. Template holder and all controls are conveniently located in front of lathe and there are no overhanging brackets or controls in rear.

9. Does not interfere with use of taper attachment.

10. Stylus control metering device built directly into compound rest.

11. You can use any standard or four-way tool block, and you can swivel the slide to suit most favorable angle for tool clearance.

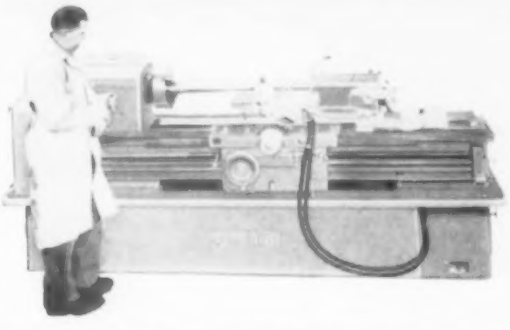
12. Feeds selected directly through regular feed box.



PROFILE FACING, easily, quickly accomplished by swinging template carrier and bed bracket as shown. Note controls are still in front of lathe. Photos show application on new 16″ RT Series.

STEPLESS FORM TURNING, contour facing, and step shafts are all in the day's work for the Hydra-Trace. Templates are flat and can be made in your own tool room. Rough and finish turning with same template.

there's a Hydra-Trace for every LeBlond heavy duty lathe...



YES, AUTOMATIC HYDRA-TRACE duplicating is available for any LeBlond heavy duty from the 13″ Rapid Production up to and including the 50″ heavy duty engine lathe.

AND THERE'S PLENTY of power and capacity in every Hydra-Trace. Take the 16″ size for example: with 3″ top slide travel you can reduce shaft diameters from 4¼″ to 6″ by varying angle settings of the tracer slide. Shaft and profile facing jobs can be accommodated up to the full swing capacity of the lathe.

TRACE IT HYDRAULICALLY WITH THE HYDRA-TRACE . . .

send us your drawings

GET THE HYDRA-TRACE FOR YOUR LEBLOND

For complete information on this productive new duplicator, send today for Bulletin HT-1. Please specify sizes of your LeBlond lathes. Address

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.
LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES
SALES OFFICES: New York, Chicago, Philadelphia, Detroit.

LeBLOND

Engineering News
ON ABRASIVE PRODUCTS

Greater Efficiency from New Coated Abrasives

A much higher degree of efficiency is being realized in dry grinding operations on metals. It is credited to the development of a new Resin Industrial Cloth specially designed for use on backstand idlers. This product is particularly effective on operations involving heavy stock removal, sharp contours, high belt speeds, heat sensitive metals, excessive frictional heat, humidity and other complications.

Strength, heat-resistance and backing characteristics provide longer productive life where severe strains are imposed. A remarkable freedom from gumming and loading, together with resistance to grain shedding, produce fine finishes, results in infrequent belt changes. This means stepped up production . . . longer runs.

To attain the greatest productivity at low cost from Resin Industrial Cloth, attention must be closely centered on its correct selection and utilization. Our field men are fully informed and experienced. It is only logical to ask their advice on your particular application. They will be glad to cooperate.

New Development in High Speed Snagging Wheels

B-5 and B-7N are a recent development in ALOXITE aluminum oxide resinoid bond wheels that represent a major advance in high speed snagging. Actual operating experience in foundry, mill, forge and welding shop operations confirms a long list of advantages. A cutting rate as high as 9500 surface feet per minute is maintained continuously throughout the extended life of these wheels; primarily because the tendency to load is much less than with previous wheels of this type. A maximum degree of safety is provided the operator under severe conditions. Speed tests to destruction reveal a much higher mechanical strength while field tests show greatly improved resistance to heat and mechanical shock.

On the less severe applications, the relatively softer bond B-5 provides faster cutting and delivers greater efficiency. The tougher B-7N is more efficient on severe operations and lasts longer. As further proof that this strength and toughness do not detract from grinding efficiency, more than a few operating reports show savings up to 50% realized where correct selection and application has been made. The experience and knowledge that fostered the development of these wheels is available, through our men in the field, in selecting the correct grit and grade to produce such results.

For prompt attention to abrasive problems, call your nearest branch office of The Carborundum Company.

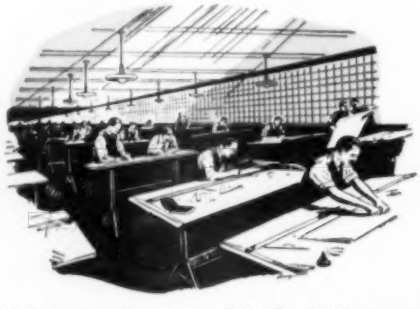
A note on Abrasives

Better utilization is leading to higher productivity...lower cost

New developments in abrasive uses are being introduced continually. They are offering new production efficiencies and often provide the solution to difficult and complicated problems.

The degree to which these benefits and improvements are realized depends upon obtaining the full value offered by these products. It means utilizing them to best advantage. The best product available will not deliver top performance under unsuitable conditions. A slight change in grit or splice—or in grade, shape, or speed can often reduce a cost or improve a finish. That is why it is so important to "fit" the abrasive products you use to the job. In the experience of many abrasive users, it is a time and money-saving must.

If you would like to know whether you can use a better abrasive product or get more production or economy from the abrasive tools you are now using, it's a simple matter to call in CARBORUNDUM. We invite you to get acquainted with our service where similar problems are being worked out every day. Abrasive engineering, technical cooperative assistance, and the vast facilities and experience of the leading name in abrasives are always ready to serve you. The Carborundum Company, Niagara Falls, N. Y.



The only complete line of Abrasive Tools is

CARBORUNDUM

TRADE MARK

"Carborundum" and "Aloxite" are registered trademarks which indicate manufacture by The Carborundum Company

Engineering News
ON ABRASIVE PRODUCTS

Greater Efficiency from New Coated Abrasives

A much higher degree of efficiency is being realized in dry grinding operations on metals. It is credited to the development of a new Resin Industrial Cloth specially designed for use on backstand idlers. This product is particularly effective on operations involving heavy stock removal, sharp contours, high belt speeds, heat sensitive metals, excessive frictional heat, humidity and other complications.

Strength, heat-resistance and backing characteristics provide longer productive life where severe strains are imposed. A remarkable freedom from gumming and loading, together with resistance to grain shedding, produce fine finishes, results in infrequent belt changes. This means stepped up production . . . longer runs.

To attain the greatest productivity at low cost from Resin Industrial Cloth, attention must be closely centered on its correct selection and utilization. Our field men are fully informed and experienced. It is only logical to ask their advice on your particular application. They will be glad to cooperate.

New Development in High Speed Snagging Wheels

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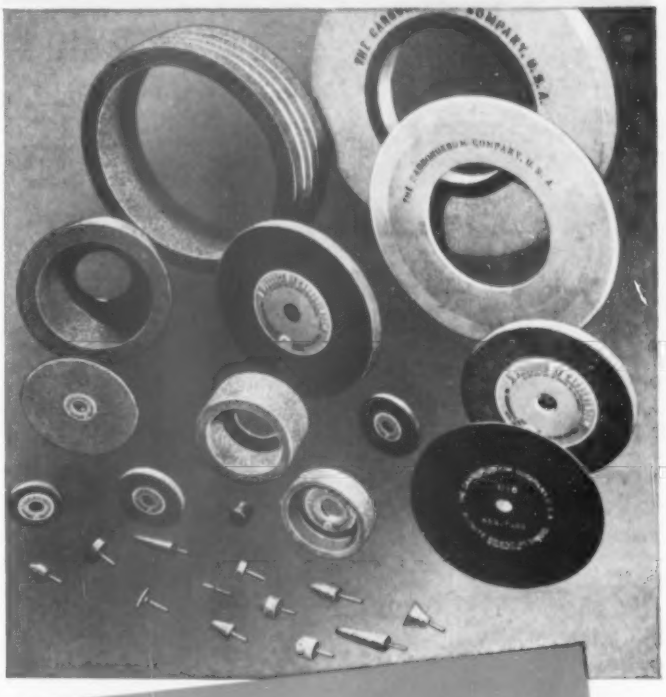
For prompt attention to abrasive problems, call your nearest branch office of The Carborundum Company.

COATED PRODUCTS — SHEETS • ROLLS • BELTS • DISCS SPECIAL SHAPES

BONDED PRODUCTS — ABRASIVE WHEELS • STICKS, STONES AND RUBS • SPECIALTIES • SUPERFINISHING STONES • SPECIAL FORMS • ABRASIVE GRAINS AND FINISHING COMPOUNDS



FOR EVERY ABRASIVE APPLICATION
. . . CALL IN
CARBORUNDUM
TRADE MARK

THE GREENFIELD STORY

of Service and Quality

"Quality Control"

MORE and more the need for quality control grows on modern management. It cuts down the wasteful scrap heap. It develops a reputation that builds sales. "Greenfield" recognized this at the turn of the century when it designed its own gages to check its threading tools. "Greenfield" sold the first commercial thread gages in 1908. In World War I, the government turned to "Greenfield" for gage-making leadership. Ever since, "Greenfield" has been a headquarters for quality control on threading operations. To obtain maximum precision without sacrificing mass production means the right tools—taps, dies AND gages. For intelligent, resultful help in the selection and use of the right threading tools and gages, *you have available a local "Greenfield" distributor and trained "Greenfield" threading engineers.*

GTD

GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

and

GEO MET RIC

THE GEOMETRIC TOOL CO.
New Haven 15, Connecticut

and

GTD AMPCO

AMPCO TWIST DRILL CORP.
Jackson, Michigan

Divisions of Greenfield Tap and Die Corporation

GTD

GREENFIELD

Be Sure
Buy "Greenfield"

Precision THREADING TOOLS

Collapsing Class S Tap and Chasers

A Universal Collapsing Tap for Stationary and Rotary use.

★ ★

Available for tapping diameters from 1 5/16" to 8½".

★ ★

GEOMETRIC also makes a complete line of Self Opening, Stationary and Rotary Die Heads and Solid Adjustable Taps. *You are invited to write today for further details.*

"Be Sure ... Buy Geometric"

THE
GEOMETRIC
TOOL COMPANY, NEW HAVEN 15, CONNECTICUT

Division of Greenfield Tap and Die Corporation

GTD

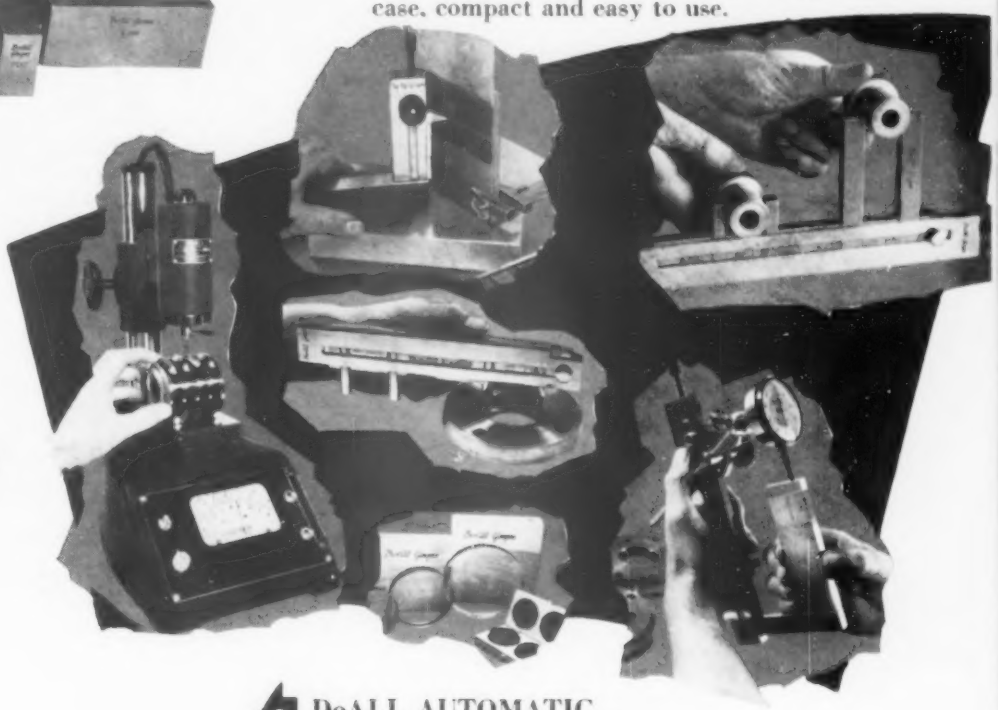
GREENFIELD TAP and DIE CORPORATION
Greenfield, Massachusetts

GTD AMPCO

AMPCO TWIST DRILL CORPORATION
Detroit, Michigan
Division of Greenfield Tap and Die Corporation

DoALL *has become*
Reg. U.S. Pat. Off.
Inspection Headquarters

1 **DoALL GAGE BLOCKS**
have superior surface finish, uniform hardness and stability, yet are priced no higher than the lowest published prices (only $350 for 83-piece, "A" grade set). Packaged in the unique DoALL "Visual" case, compact and easy to use.



DoALL'S COMPLETE SETS OF ACCESSORIES
make your gage blocks into profitable everyday shop tools. These precision instruments and gage blocks are easily assembled to construct snap gages, go-and-no-go gages, height gages, layout scribers, etc. The DoALL Comparator is the world's most versatile; has four separate ranges. **2**

3 **DoALL AUTOMATIC SORTING MACHINES**
give you the fastest inspection and the infallible accuracy of the electronic selector. A versatile table model for the average plant sells for less than $2,000. Special units are designed and built for large volume, multiple-dimension inspection and sorting.

DoALL SERVICE ENGINEERS*
give that famous service that you have always received on DoALL Bandsawing Machines and DoALL Precision Surface Grinders. **4**

5 Write for book
"QUALITY CONTROL"

DoALL

*THIS IS MR. ELMER ENGELHARDT OF DoALL WISCONSIN CO., MILWAUKEE.
THERE ARE 30 DoALL STORES TO SERVE YOU

Here's a Tip
On DRILLING PLASTICS

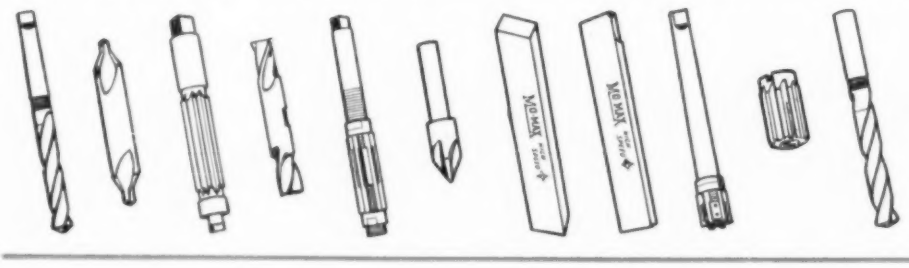
Actual Tests Show Importance of Selecting the Right Drill

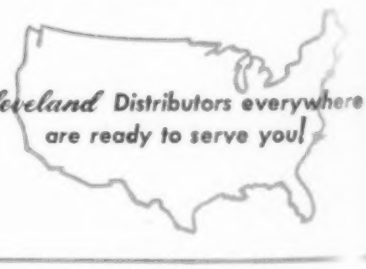
Drilling deep holes in plastic can be a problem . . . if you're using the wrong drill. Take these nitro-cellulose screw driver handles, for instance. An eastern manufacturer was getting only 600 holes per grind, until a *Cleveland* Service Representative ran a test on the CLE-FORGE High Speed Drill shown at the left. Now the handles are being drilled at the almost unbelievable rate of 3,000 holes per grind! *Cleveland* Service Representatives are trained to help you cut your drilling costs. Contact our nearest Stockroom, or . . .

Telephone Your Industrial Supply Distributor

THE CLEVELAND TWIST DRILL CO.
1242 East 49th Street **Cleveland 14, Ohio**
Stockrooms: **New York 7 • Detroit 2 • Chicago 6 • Dallas 1 • San Francisco 5**
Los Angeles 11 • London W. 3, England

ASK YOUR INDUSTRIAL SUPPLY DISTRIBUTOR FOR THESE AND OTHER CLEVELAND TOOLS





THE CASE OF THE SUSPECTED SHORT-CUT

METALITE® Cloth Belts *prove* two-in-one operation practicable

This manufacturer believed his finish grinding operations, on wrenches and gear bars, took too long — requiring two operations with separate set-up wheels of different grits to produce an acceptable finish.

So he tried the belt backstand method and discovered he could obtain an even better finish in less time with simply *one #40 grit METALITE Cloth Belt.* An entire operation was eliminated — production time and cost slashed. Naturally he switched to METALITE Cloth Belts.

These fast-cutting backstand belts are saving finishing costs in shops everywhere. They cut evenly without scratching because their uniform grit is doubly anchored with Behr-Manning's own DURA-BONDED® process.

If you rough grind, finish grind or polish grind, and want to make sure you're doing it as fast and as economical as possible, check with the Behr-Manning Man. He'll be glad to demonstrate METALITE Belt grinding in your own plant. Write us about this test.

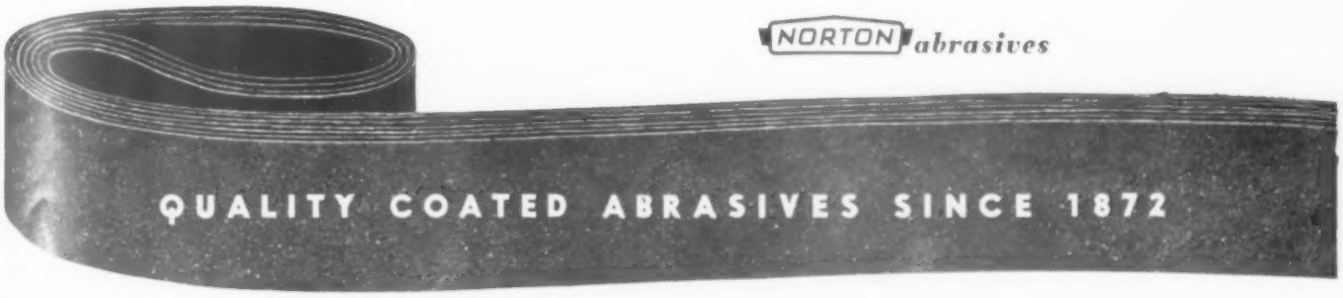
GET THE COMPLETE SERIES

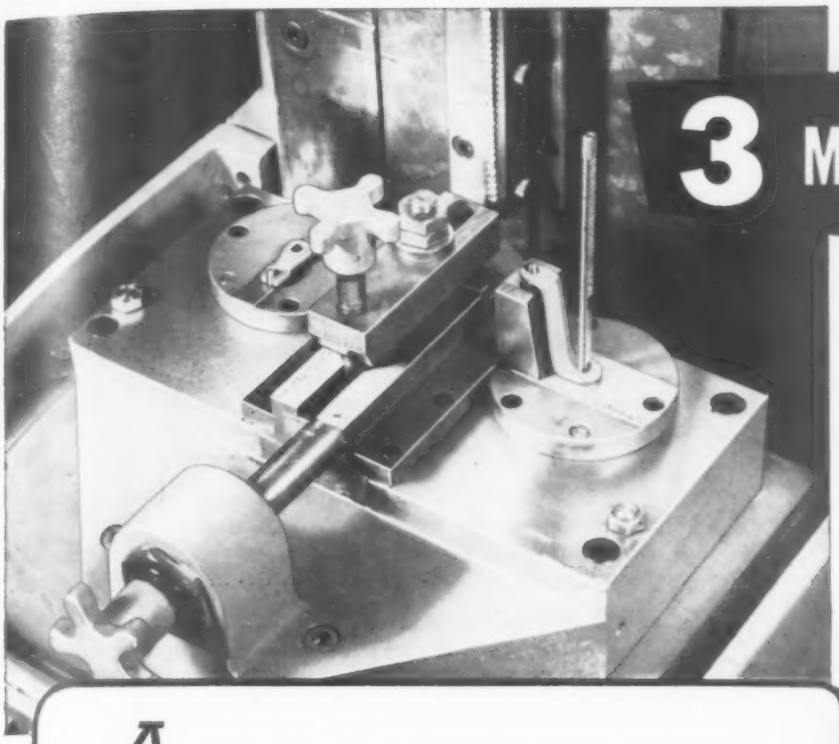
Our booklet "Production Talks Backstands" gives you a whole series of similar case histories with convincing facts and figures. Write for your copy today.

BEHR-MANNING

BEHR-MANNING · TROY, N.Y.

NORTON *abrasives*





3 MACHINES IN 1

You Can Do

PULL DOWN INTERNAL BROACHING

PUSH DOWN INTERNAL BROACHING

and SURFACE BROACHING

on the *American* 3-way

AMERICAN 3-Way Broaching Machines are general-purpose machines that can be used efficiently on many classes of work. They are adaptable to internal broaching (both push down and pull down) and surface broaching; and are easily changed over from one operation to another.

American 3-Way Broaching Machines are easily operated, highly productive, and flexible in their applications. Their quick change-over makes them especially suitable for broaching in limited quantities. Six standard models are available—4, 6, or 8-ton sizes with 24″ stroke, and 8, 10, or 15-ton sizes with 36″ stroke.

Photo at top of page illustrates one of many multiple tooling arrangements possible on the *American* 3-Way. Permanent tooling set up is adapted to either surface broach a slot at the center station, or internal broach flatted holes at left and right hand stations. *Left:* Parts for automatic transmissions before and after broaching. Small part at top is shown before broaching to form slot and finish flatted hole. Flatted hole has also been finished in lower section of center part. *Right:* A sliding fixture locator is used at the center station of this *American* 3-Way Broaching Machine to allow loading and unloading clear of broach assembly. At other stations parts are located by pins.

Full details and specifications on *American* 3-Way Vertical Hydraulic Broaching Machines are given in this new illustrated bulletin. Write for your free copy. Just say "Send me Circular 100 S."

AMERICAN

American BROACH & MACHINE CO.

A DIVISION OF SUNDSTRAND MACHINE TOOL CO.

ANN ARBOR, MICHIGAN

SUNDSTRAND MACHINE TOOL CO. S

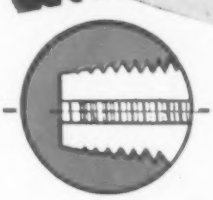
See *American* First—for the Best in Broaching Tools, Broaching Machines, Special Machinery

NOW —You Can Get Better Tapping at Lower Cost with BESLY'S New "Forty Niner" Taps

BESLY TAPS

MICROCENTRIC CHAMFER

ASSURES FREE CUTTING TO SIZE WITHOUT BURRING OR WELDING



UNSURPASSED ACCURACY ...at all vital points

Microcentric CHAMFER

Micro finish, concentric to tenths of thousandths. Cuts freely and to size without burring or welding.

Solid Ground THREAD FORM

For angle and lead accuracy, elimination of gauging problems and control of pitch diameter to tenths of thousandths. Ground from the solid.

"Right" ROCKWELL

Taps pre-inspected for correct Rockwell hardness.

Mirror Finish FLUTES

Correctly designed to provide freer chip flow and longer tap life.

Tru-Square DRIVER

Square and shank fit correctly in chucks and holders, no wobble to cause oversize holes.

Choose Besly "Forty Niner" Taps to get the advantage of chamfer that's *right* from the start. Check these important points of chamfer superiority:

FINISH — To micro-inches to eliminate welding, loading and burrs.

CONCENTRICITY — To tenths of thousandths with equal chip load — land-to-land — that eliminates size problems.

RELIEF — Consistently accurate land-to-land and tap-to-tap. Free cutting, with minimum power required to drive.

Accuracy in chamfer is just one of *many* reasons why Besly "Forty Niner" Taps deliver top tapping efficiency. On *every* count you get the advantage of proven taps that are produced by *new* tap making machinery and checked by *new* inspection processes *exclusive* with Besly.

Add to this, Besly's *fast* delivery, expert tap engineering counsel and service by fully qualified distributors and you have a combination that can give you *accurate threading at the lowest possible cost*. Call your Besly distributor today for a performance test that will prove it.

BESLY'S "HELPING HAND" HAS 5 STRONG FINGERS

Fast Delivery

—24 hrs. on taps from hardened blanks;

—3 weeks on bar stock specials.

A Complete Line
Top Tap Quality
Engineering Counsel
Qualified Distributors

This Trade Mark Identifies The World's Most Accurate Tap

BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

BESLY

CHARLES H. BESLY & COMPANY, 118-124 N. Clinton Street, Chicago 6, Illinois
***Factory:* Beloit, Wisconsin**

Locating to close tolerances—2 case studies

Automatic drilling and tapping machines cut costs by locating operations accurately and increasing output per man-hour

Dear Sir:

Automatic drilling and tapping machines locate operations to close tolerances in production because:

All tools operate on the part in the same chucking.

Bushings guide drills and reamers. Bushing plates pilot to the fixtures.

Spindles are located to exact indicator readings.

Automatic unvarying cycles make all parts uniform.

Cost is low when output is high

Notice how low the costs are: 15c for the cam with 56 operations; 2-3/10c for the brake cylinder with 11 operations. These costs include both man and machine on this basis: (1) the current average national wage rate, (2) 80% efficiency, and (3) the machine paid for after only 6000 hours, a fraction of its profitable life. No power or overhead.

Cost is low when a Kingsbury does many operations each hour. Reduce output and naturally unit cost goes up. Sometimes this makes a Kingsbury uneconomical. But if accurate location is a problem, it may still be the best solution. That reminds us of a story.

An expert is surprised

A man who knew our machines saw us one day during the war. "I always thought Kingsburys were high production machines."

"You are 98% right," we said.

"Well then, I just saw some of that other 2%," he said. "An aircraft plant I just visited has a line of 11 Kingsburys. Only one machine was running at a time. Fellow would put one lot of cylinder heads through a machine, shut it off, take the truck load to the next machine and do the same thing there."

"Locating to close tol—," we began.

"Oh, sure, sure, sure," he said. "I realized that right off. After I looked at the job I would hate to do it any other way. Fellows there are tickled to death with their Kingsburys. Said they had several lines of them."

"Indeed they have," we said. "Just ask us to figure a compound angle. We have done so many of these machines we are old hands at compound angles. But at first we had to have 10 engineers figure them. When 2 of them agreed we started with their figures and went on from there."

We admit this application is unusual. We even admit (reluctantly) that there are other ways to drill and tap to close tolerances in production. But we do feel that our proposals for this work merit your serious consideration.

For many high production jobs

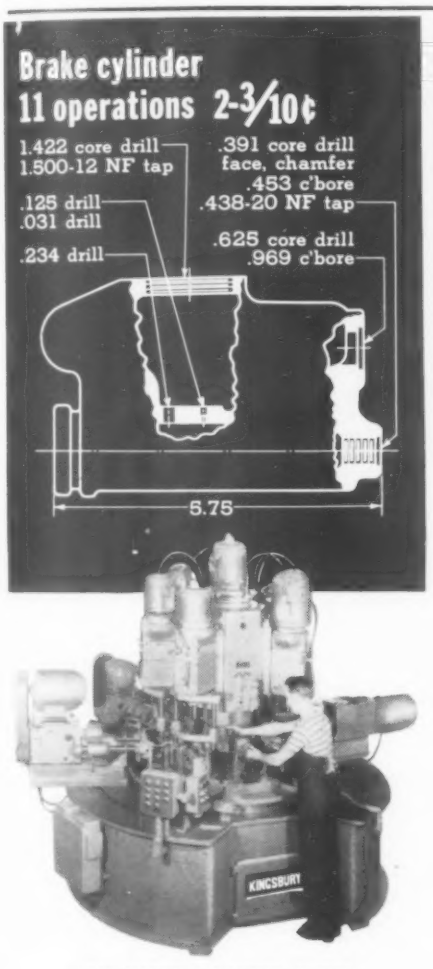
Locating to close tolerances is an important advantage with a Kingsbury. But low cost on high production work is still the main reason for using them. We can make efficient setups for many different jobs — simple or complex, with small or medium operations. (Note the brake cylinder with .031 drill and 1.422 core drill in the same chucking.) Here is why: We can choose from a complete line of standard drilling, tapping and indexing units and attachments. We have designed, built and tooled over 3,500 machines. It is our sole business.

Can we make you a proposal for a tooled machine? Just send a print to our Mr. L. A. Carll. Tell him the operations and hourly output you need. It is worth a few minutes to get the facts.

Sincerely,

Kingsbury Machine Tool Corp.
60 Laurel St., Keene, N.H.

P.S. Free bulletins showing 40 setups are yours for the asking. Please use your company letterhead.



360 PARTS AN HOUR GROSS

To locate every operation exactly, bushings guide every tool except the taps. A ball bearing bushing guides the 1.422 core drill. Other bushings are plain. All bushing plates plug into the fixture or the part itself.

• Ten units operate in turn on each part. The base supports 4 horizontal units, the central column 6 vertical units. Every tool is in easy reach because the working area is not caged in.

• Note the range of operations. A 1.422 core drill (5 hp) and a .031 drill (½ hp) operate in the same chucking.

49 PARTS AN HOUR GROSS

This is one of 10 Kingsburys that an automobile plant uses on related high production jobs to locate accurately peripheral holes inclined at a 40° angle to the surface.

• Bushings in piloted plates guide 3 of the 5 tools for each peripheral hole. The sequence: end mill (guided), drill first step (guided), drill through, line ream (guided) and finish ream. Drilling in 2 steps maintains required output by keeping the time cycle down.

• Each part passes around the machine 4 times. After the 1st, 2nd and 3rd passes, the operator rotates each fixture 90°. Each time around, 2 vertical units with 2-spindle auxiliary heads operate on two .203 holes, and 10 horizontal units operate on 2 adjacent peripheral holes. Five horizontal units are 22½° left of the radial line, 5 are 22½° right. 85

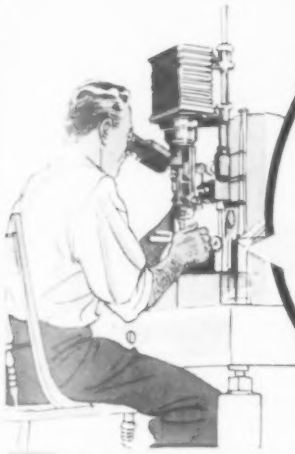
KINGSBURY

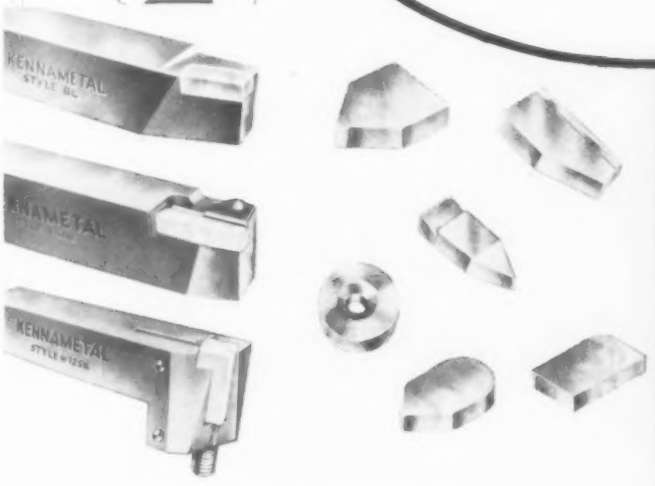
AUTOMATIC DRILLING
AND TAPPING MACHINES
for Low-Cost High Production

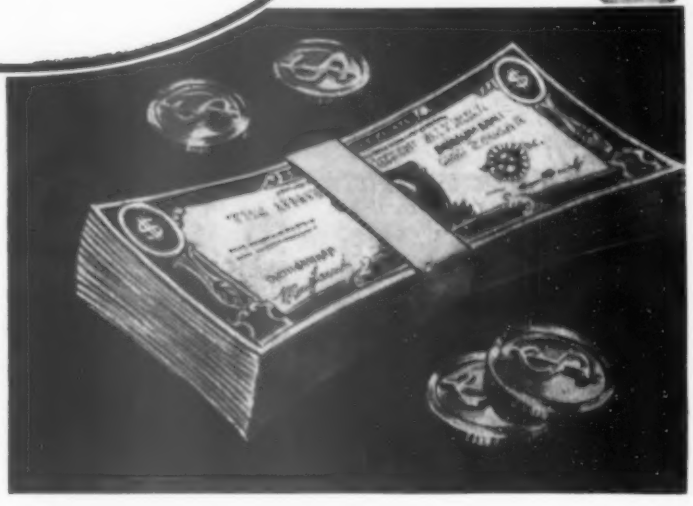
CONTROL

Based on Facts

Based on Fancy







Kennametal is controlled in conformity with precision methods that time and experience have proved to be the best for producing cemented carbides of consistent worth.

Our U.S. currency has, for 15 years, been under arbitrary controls set by official decree in violation of traditional experience with sound money systems.

The controls of Kennametal are exacting and continuous to assure that: basic ingredients are pure; carbides true and of correct particle size; compositions accurately blended; blanks pressed compactly; and sintering processes free from contamination.

Currency control, as now in vogue, is illogical and unscientific. Since anchorage to gold was removed by edict, irredeemable paper certificates have been freely issued. They are merely vague promises to pay amounts not clearly defined—symbols of debt, unsupported by adequate resources.

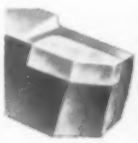
The rigorous control of Kennametal is an asset. It results in the production of more carbides, yet their value as cost-saving materials is enhanced and maintained. Durability permits a satisfactory job to be done with fewer "units."

The lax control of currency is a liability. Money is no longer a fixed measure for present or future evaluation, a reliable medium of exchange, nor a check on the public purse by citizens. More dollars are in circulation, but their purchasing value has been greatly reduced. Cheap money always brings high prices—because more "units" are required for a given job.

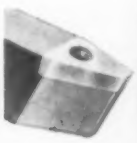
To offset dollar rises in costs during inflation or to safeguard profit margins in times of deflation, you can improve the efficiency of plant operations and increase production by a more widespread use of Kennametal.

To effect correction of deranged economic conditions, you can urge the enactment of legislation that will bring back a stabilized monetary system—the redeemable Gold Standard.

Brazed-on Style AL



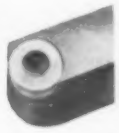
Brazed-on Style 40



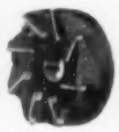
Screwed-on Style SVG

KENNAMETAL Inc.
LATROBE, PA.
MANUFACTURERS OF SUPERIOR CEMENTED CARBIDES AND CUTTING TOOLS THAT INCREASE PRODUCTION

Kennamatic Style 3TK



Kendex Style 3RKD



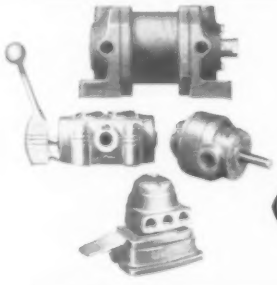
"Universal" Face Kennamill

3 essentials

GEROTOR offers to help you apply the correct air and hydraulic devices to your equipment!

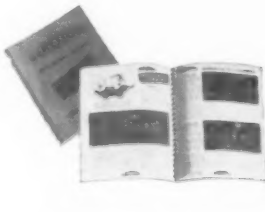
1 Engineer-Distributors at Your Service

Gerotor service is featured by the engineering assistance of its factory trained distributors. These men are qualified from long experience to handle any air and hydraulic problem. Located in all principal cities, they can assist in laying out the circuit best suited to your operating requirements and recommend the correct equipment to provide long years of satisfactory operation.



2 The Complete GEROTOR Line

Gerotor can furnish the exact model valve, cylinder and pump to meet individual requirements. For example—Gerotor 4-Way Hydraulic Valves are offered in 50 models with 4 types of action—standard, spring return, spring centered and ball detent; 5 piston designs; 6 types of operation—hand, foot, cam, solenoid, oil and air pressures; 7 sizes—$\frac{1}{4}$", $\frac{3}{8}$", $\frac{1}{2}$", $\frac{3}{4}$", 1", $1\frac{1}{4}$" and $1\frac{1}{2}$".



3 Informative Literature

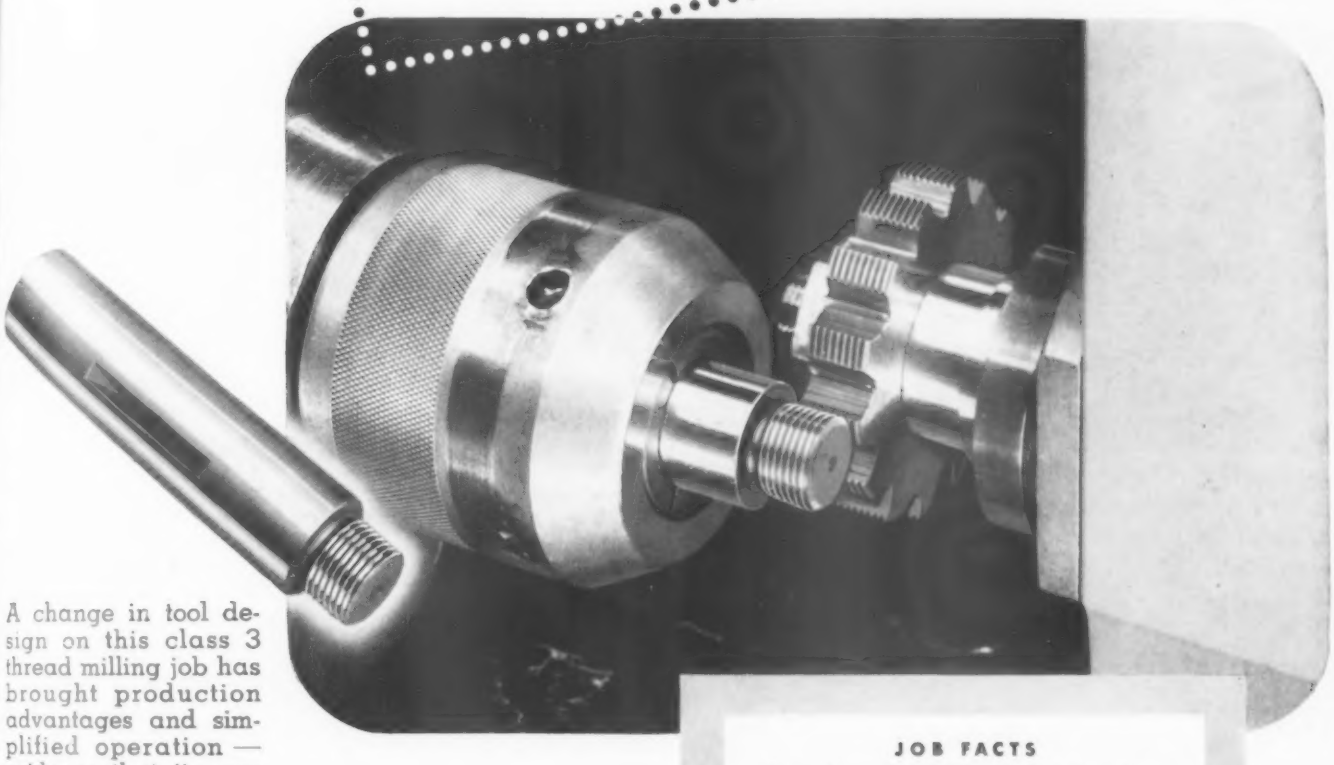
The 100-page Gerotor Catalog describes every detail of hydraulic and air valves, cylinders, pumps, pump units. It represents the most thorough presentation of hydraulic and air devices that long experience in this field can prepare. If you do not have the new Gerotor Catalog in your file for reference and assistance, write for your copy today.

GEROTOR MAY CORPORATION
Dept. TE-3 Baltimore 3, Maryland

WHEN YOU APPLY HYDRAULIC OR AIR POWER *Plan with*

GEROTOR

5 REASONS WHY IT PAYS TO USE BARBER-COLMAN Job-Engineered Cutters



A change in tool design on this class 3 thread milling job has brought production advantages and simplified operation — evidence that it pays to use cutters designed to suit the job conditions.

Ground shank type thread mills previously used have now been redesigned as unground shell type cutters. In addition to the larger diameter and greater number of teeth, this design provides a rigid, short-coupled drive.

Results show: FASTER SET-UP—due to easier mounting on the machine and gaging size across an even number of teeth; EASIER SHARPENING—three cutters at a time in place of one; MORE TOOL LIFE—larger number and longer cutting teeth give 3 times as many sharpenings and 50% more pieces per sharpening; LESS TOOL COST—unground cutters produce the accuracy required; and MORE PRODUCTION—8 pieces more per hour are threaded.

JOB FACTS

Operation — Mill 3/4"-16 class 3 threads on pump shaft.

Material — 4120 Steel, 25 R.C.

Cutters — B-C Job-Engineered Shell Thread Mills, 3" x 5/8" x 1".

Speed — 225 RPM

	Former	Present
Fl-to-Fl. —	27/hour	35/hour
Tool Life —	5 Sharp., 100 pces. per sharp.	15 Sharp., 150 pces. per sharp.

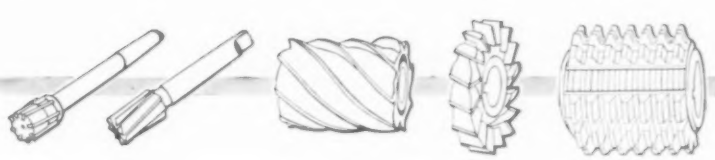
It pays to use Job-Engineered cutting tools wherever standard dimensions will not apply. The savings speak for themselves.

METHODS ENGINEERS!

Special file of typical performance on job-engineered cutter designs. Available without obligation. Send request on your company letterhead for File No. 4411.

Barber-Colman Company

GENERAL OFFICES AND PLANT, 4411 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.



BARBER COLMAN

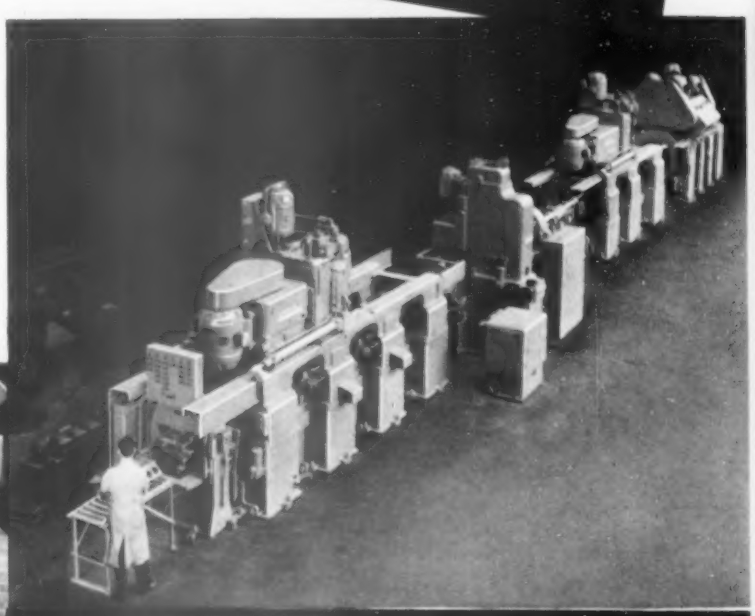
INGERSOLL PROCESS MACHINES
For Reducing the MAN HOURS per piece

Another COST-CUTTING Application of VICKERS HYDRAULICS

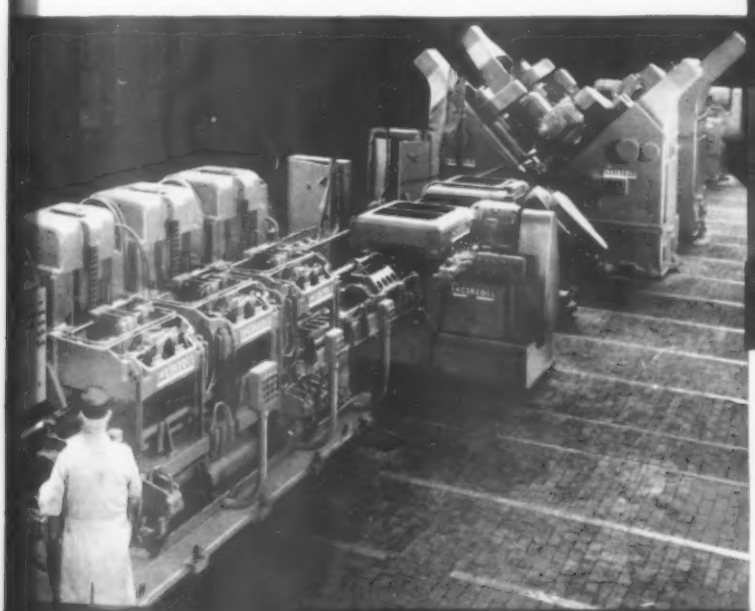
The two Ingersoll Process Machines illustrated here are being used for completely machining automobile cylinder blocks . . . they provide the extreme precision required and at the same time reduce the cost. It is significant that Ingersoll selected Vickers Hydraulic Controls for the many operations that can best be done with hydraulics.

Progression of the blocks through the machines is accomplished automatically, the time-saving transfer mechanisms being hydraulically actuated. Hydraulic circuits of the individual units provide for correct sequential positioning, clamping, traversing, feeding and returning. Interlocks assure accurate positioning, secure clamping and removal of interfering transfer members before cutting operations begin . . . also clearance of all cutters before transfer to next station can take place. Objectionable deflection is prevented by limiting the clamping pressure.

Get in touch with the nearest Vickers Application Engineering Office for information on how Vickers Hydraulics can improve your products.



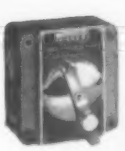
Ingersoll 9-Station Process Machine has Vickers Hydraulic Controls to help secure extreme precision in cylinder blocks at lowest cost.



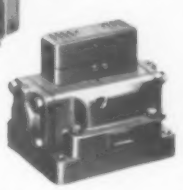
Ingersoll 11-Station Process Machine receives cylinder blocks from machine at right and similarly has Vickers Hydraulic Controls.

Representative VICKERS HYDRAULIC CONTROL UNITS USED ON INGERSOLL PROCESS MACHINES

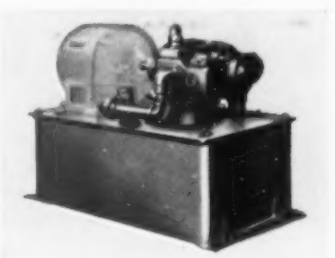
Pressure Controls, Bulletin 45-34a



Flow Control Valve, Bulletin 45-35



4-Way Valve, Pilot Operated, Selenoid Controlled, Bulletin 48-27



Power Unit, Bulletin 46-43a

VICKERS Incorporated

DIVISION OF THE SPERRY CORPORATION

1416 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices:

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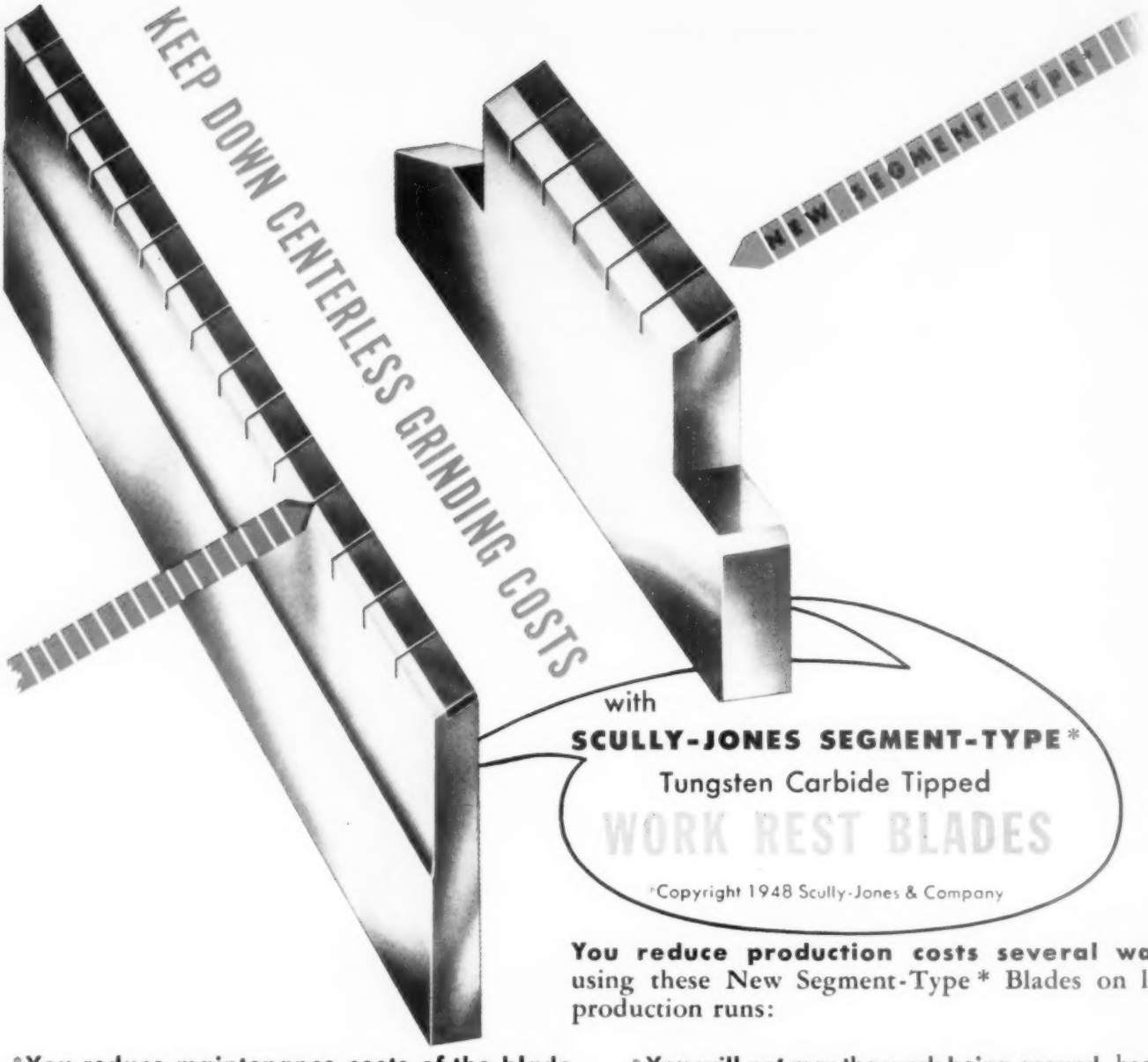
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921



You reduce production costs several ways, using these New Segment-Type * Blades on long production runs:

• **You reduce maintenance costs of the blade,** because the short segments resist warping during the brazing process. This avoids any strains in the carbide which may occur when brazing long strips, and which often result in quick failure of the blade.

• **You have less down time,** because the harder grade of carbide, used for tipping, gives longer wear and requires only occasional regrinding.

• **You produce more pieces "to specifications,"** because the blade will maintain its alignment while in service.

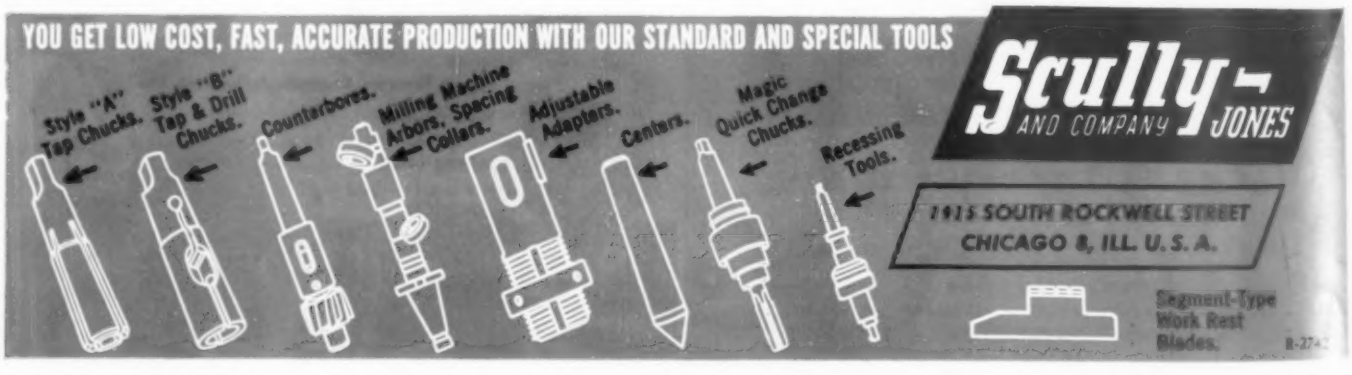
• **You will not mar the work being ground,** because the slots between the segments, permit the coolant to wash away any chips and keep temperature of blade at proper efficiency point.

• **You save money in reconditioning a blade,** because you need only replace damaged segments, not the whole strip.

IMMEDIATE DELIVERY

of popular sizes, from stock

Write for folder showing complete specifications and prices on this new type of Work Rest Blade.



N. A. WOODWORTH

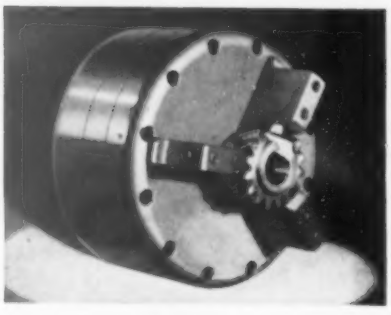
ENGINEERED PRODUCTS

ACCURACY YOU CAN TRUST

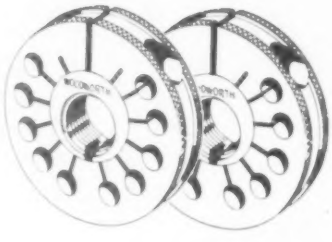
CONE-LOK JIGS

Chucks engineered and built by Woodworth guarantees the ultimate in precision gear chucking.

Woodworth Cone-Lok Jigs are noted for their mechanical simplicity and "life-time" construction.



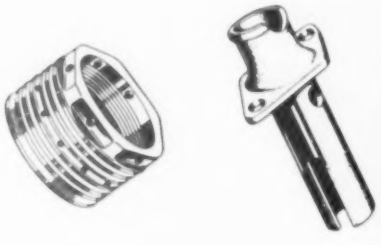
DIAPHRAGM CHUCKS



PRECISION GAGES

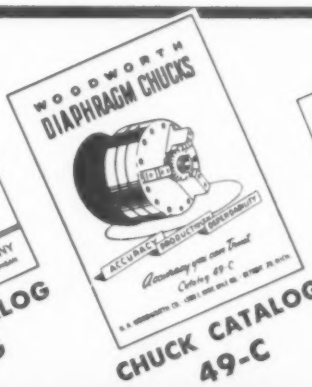
Woodworth manufactures a complete line of thread ring and thread plug as well as cylindrical plug and ring gages. Also produces special gages to customer blueprints.

N. A. Woodworth engineering gives you plus value in precision parts. Production men with "know-how" combined with well equipped plant are pace setters in aircraft engine and radar assembly fields.



PRECISION PARTS

GAGE CATALOG 48-G



CHUCK CATALOG 49-C

JIG CATALOG 46-J

WRITE FOR LITERATURE

New, comprehensive catalogs on N. A. Woodworth chucks, jigs and gages. Precision parts data supplied upon request for specific information. All inquiries should be on your company letterhead and mailed to address below.

WOODWORTH

N. A. WOODWORTH CO., 1300 EAST NINE MILE ROAD • DETROIT 20, MICHIGAN

PRECISION GAGES • DIAPHRAGM CHUCKS • CONE-LOC JIGS • PRECISION PARTS

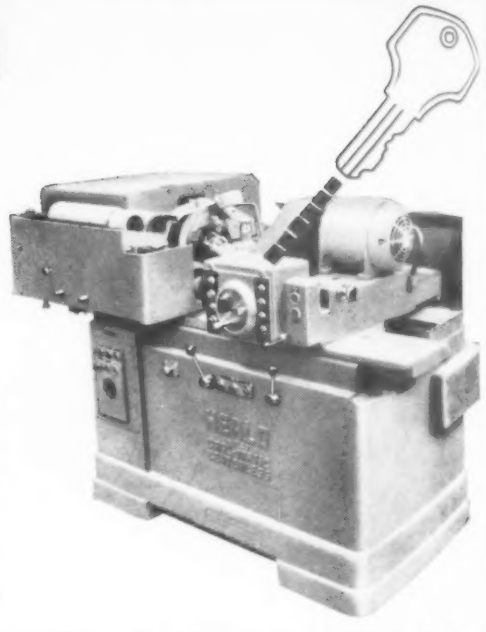
KEEP YOUR PRECISION UNDER LOCK AND KEY!

On the New Heald machines you can lock your set-up as easily as you lock your car

There's nothing new about a lock. But there's a brand new advantage in being able to use locks on controls set for precision finishing equipment. Here's how the new Heald Bore-Matic and Grinders make it possible.

Simply dial your machine set-up on any new Heald machine, then turn the key—and forget about making the usual compensating adjustments for temperature rises and consequent changes in oil viscosity. Your precision is literally under lock and key. Such an achievement has been made possible by several new Heald line features. Heat generating pumps and rotors are isolated from the machine base, pump motors are fan cooled and bridges are cored out to allow heat to dissipate itself. On top of all this heat prevention, any temperature rise which does occur is effectively nullified by the new Heald constant feed hydraulic system of regulating flow of oil. This means your set-up stays "put" where you want it, and, better still, this means completely controlled production in quality and quantity as well.

Ask your nearest Heald representative to give you further details on this time-saving, labor-saving, money-saving feature.



All new Heald Grinders and Bore-Matics include the features which enable you to lock your cycle settings and assume maximum control over precision, production and uniformity.

HEALD

THE HEALD MACHINE COMPANY, Worcester 6, Mass.

Branch Offices in Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

In this method

of Tool and Die Making —you Buy Less Steel and Reduce Machining Costs

Write for New Booklet:

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Gives you full details on FCC Air Hardening, Oil Hardening and other Cast-To-Shape Tool Steel Specialties capable of saving you time and money.

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FCC Cast-To-Shape, the modern method of tool and die making, is effecting important savings of time, trouble and money for an increasing number of manufacturers.

Even very intricate shapes can now be cast successfully within an eighth inch of finished size. This means that you buy less steel at the start and reduce machining costs substantially.

Tools which could not be made by conventional methods except in sections can often be fabricated from FCC Cast-To-Shape blanks in a single piece.

In many instances performance of the tool is better than can be obtained by fabrication from bar stock or forgings.

Particulars are available through Allegheny Ludlum representatives; or write for the booklet today.

ALLEGHENY LUDLUM

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DETROIT 20, MICHIGAN

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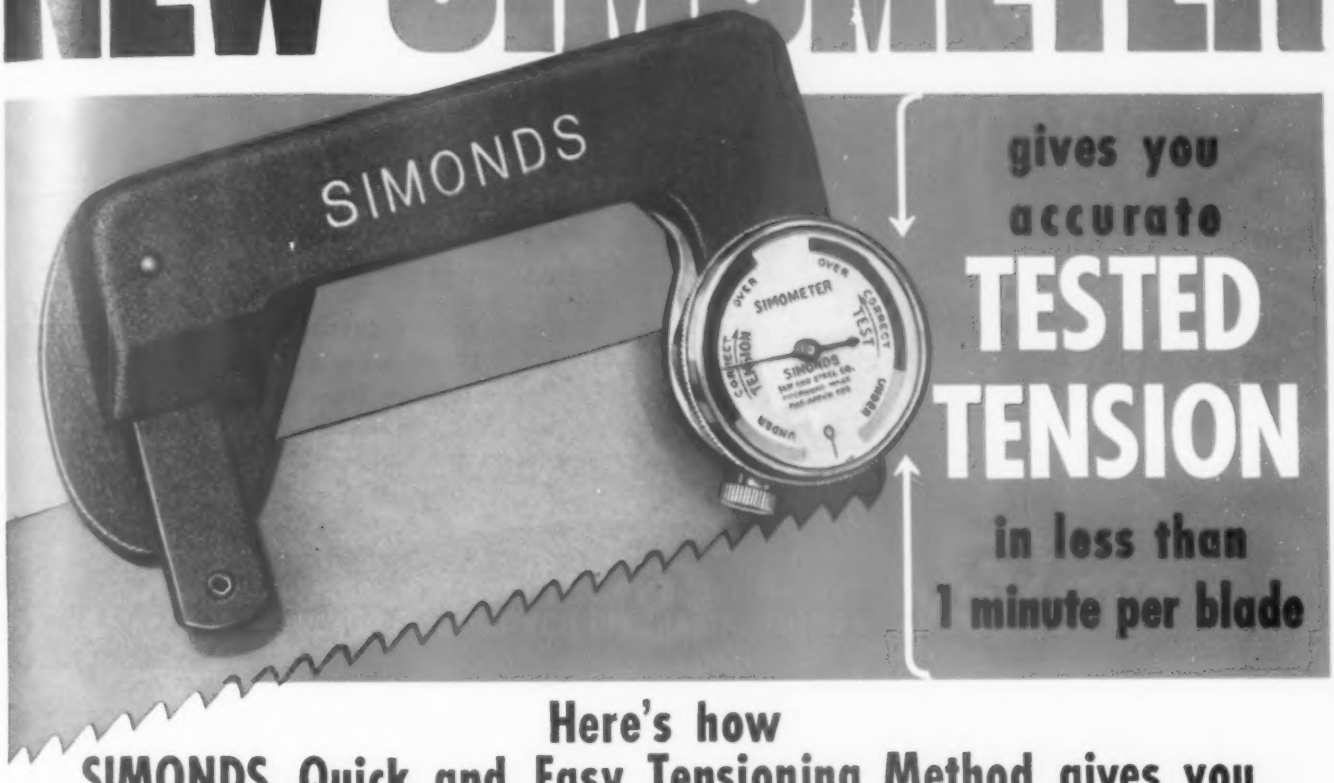
NEW SIMOMETER



gives you accurate TESTED TENSION in less than 1 minute per blade

Here's how SIMONDS Quick and Easy Tensioning Method gives you LONGER BLADE LIFE!

Avoid Undertension which causes crooked cutting, spoiled work, lost time.

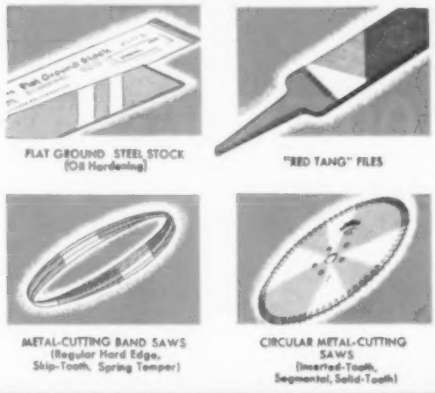
Avoid Overtension which causes blade-vibration, rapid dulling of teeth, frequent blade-breakage.

Slip the *Simometer* Directly over Blade, tighten two thumbscrews . . . now put tension on blade until **Simometer** needle moves into green zone . . . and you *can see at a glance* you have the right tension on the blade.

Then You're Set to get Faster, Straighter Cuts... and more cuts per blade . . . *the full measure* of performance which **SIMONDS** "Red End" Power Blades are made to give you. Ask your distributor.

BRANCH OFFICES: 1350 Columbia Road, Boston 27, Mass.; 127 S. Green St., Chicago 7, Ill.; 416 W. Eighth St., Los Angeles 14, Calif.; 228 First St., San Francisco 5, Calif.; 311 S. W. First Avenue, Portland 4, Ore.; 31 W. Trent Ave., Spokane 8, Washington. *Canadian Factory:* 595 St. Remi St., Montreal 30, Que.

SIMONDS ALSO MAKES:



FLAT GROUND STEEL STOCK (Oil Hardening)

"RED TANG" FILES

METAL-CUTTING BAND SAWS (Regular Hard Edge, Skip-Tooth, Spring Temper)

CIRCULAR METAL-CUTTING SAWS (Inserted-Tooth, Segmental, Solid-Tooth)

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SIMONDS "Red End" HACKSAW BLADES

WHEN YOU USE SIMONDS YOU STAY IN THE HIGHLANDS . . . OF CONSISTENT CUTTING EFFICIENCY

for both of the Two Ways to Think

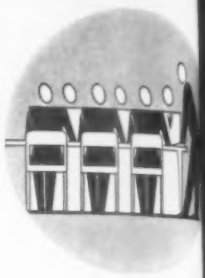
QUESTION: YOU ARE FACED WITH A SUDDEN NEED FOR MORE HIGHLY-SKILLED MANPOWER. WHAT WILL YOU DO?

Answer OF EXECUTIVE GROUP **A:**

WE SHALL ADD TO OUR PAYROLL TEMPORARILY: attempt to hire more engineers and work our staff overtime.

Answer OF EXECUTIVE GROUP **B:**

WE SHALL NOT DISTURB OUR PRESENT STAFF: we will get temporary assistance from a well-established, capable firm of engineers and designers.



QUESTION: YOU ARE GOING TO DEVELOP A NEW PRODUCT, OR REDESIGN A PRESENT ONE, AND PUT IT INTO PRODUCTION. WHAT WILL YOU DO?

Answer OF EXECUTIVE GROUP **A:**

WE WILL FOLLOW OUR CRAFT TRADITION, using the same features and basic production methods we now have, and "dress it up."

Answer OF EXECUTIVE GROUP **B:**

WE SHALL BRING IN ALL THE NEW KNOWLEDGE of consultants who work with many industries —new methods, materials, machining processes, and crafts.

QUESTION: YOU MUST CUT COSTS THROUGH DRASTIC IMPROVEMENTS IN PRODUCTION METHODS. WHAT WILL YOU DO?

Answer OF EXECUTIVE GROUP **A:**

WE WILL CALL A MEETING of our executives and put our entire staff to work on it.

Answer OF EXECUTIVE GROUP **B:**

THIS CALLS FOR OUTSIDE EXPERIENCE, bringing to bear on our problems the most progressive ideas of modern manufacturing.

To Executive Group A

Find out about the varied services of the Pioneer staff. Solving the problems of several industries has given Pioneer the experience that can save you time and money.

To Executive Group B

The Pioneer Staff is the experienced group of engineers and designers you are looking for. Its highly-skilled technicians will bring you the answers to your problems.

The Pioneer Staff *answers most of the problems!*

INTERNAL ORGANIZATION

Establishment of the framework to execute management's policies; simplification of routines to handle orders, records and reports with minimum paperwork; allocation of responsibility and authority to prevent friction caused by overlapping controls.

PRODUCT DESIGN AND DEVELOPMENT

Realistic comparison drawn between cost of developing and manufacturing a new product and probable realization of returns; existing products redesigned for increased sales appeal by comprehensive analysis of appearance, function and performance.

PRODUCTION METHODS

Study of production sequence to eliminate, combine, change order of, or simplify operations; analysis of basic process and recommendations for machines, tools and accessories to competently balance out production lines.

QUALITY CONTROL

Compilation of accumulative tolerance charts to assure any product meeting established manufacturing limits; correct location of inspection points and setting of standards and procedures to keep scrap at absolute minimum.

TOOL AND SPECIAL MACHINE DESIGN

Design of tools, dies, jigs, fixtures and gages to complement and implement any machine; modern production problems conquered by specially designed machine tools incorporating hydraulic, pneumatic or electronic controls.

TIME AND MOTION STUDY

Determination of quickest and best work sequence with suggested improvements in workplace, methods and tools; study of operators' physical movements to correct bad operating practices, lessen fatigue and increase efficiency.

MATERIAL HANDLING

Unbiased recommendation and selection of equipment best suited to job—whether it be hand trucks, truck tractors, power-lift trucks, stackers, gravity-roll, power or chain conveyors, cranes or hoists.

PLANT LAYOUT

Flexible plant arrangements for steady progression of production obtained through preparation of process flow charts which clearly reveal bottlenecks; charts may be projected into template or scale model layouts for even more detailed study.

PRODUCTION CONTROL

Channeling work through a plant so sales schedules are kept in definite balance with production capacity; machine loads are accurately charted to give assurance that delivery dates can be met.

COST CONTROL

Determination of pertinent cost information, currently accurate, for use as a means of establishing prices and operating efficiency, to guide and guard present conditions and intelligently chart an organization's future course.

PIONEER ENGINEERING & MANUFACTURING CO.

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SPECIALISTS

ENGINEERS, DESIGNERS, CONSULTANTS AND PRODUCTION SPECIALISTS

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IF YOU DESIGN FOR AIR OPERATION YOU'LL WANT TO KNOW ABOUT THESE REVOLUTIONARY AIR CYLINDERS

HERE are Air Cylinders so different in design that they have become known as the Bellows Air Motors. They are not rotary motors but double-acting, reciprocating, cylinder-type power units. Four-way directional valves and separate speed control valves for advance and retract strokes are built-in. Only one air connection is needed, which can be flexible hose.

Mechanically operated models are equipped with an operating lever which works from any angle in any plane. It may be operated by hand or foot, or may be linked mechanically with any moving element.

Electrically operated models are designed for electrically interlocked equipment.

Bellows Air Motors are available in bores of 1¼", 2½", 3⅜" and 4½", and in any stroke length. They can be mounted in any position.

WRITE FOR FREE BOOKLET

Complete description of Bellows Air Motors, technical data, dimensional tables, case histories, etc. Ask for bulletin BM-20. Address: The Bellows Co., Dept. TE-349, 222 W. Market St., Akron 9, Ohio.

• HYDRAULIC CHECKING OF AIR POWER

The Bellows Hydro-Check removes the natural "bounce" and "springiness" from air — gives the smoothness of hydraulic operation to air-powered equipment — but keeps the speed, flexibility and economy of air-operation. The Hydro-Check is available for use with all Bellows "Controlled-Air-Power" Devices or may be installed to regulate and control the piston movement of standard Air Cylinders.

The Bellows Co.

AKRON, OHIO

MANUFACTURERS OF AIR CYLINDERS, AIR MOTORS, AIR-POWERED FEEDING DEVICES, AIR COLLET CHUCKS, AIR VISES AND AIR HYDRAULIC VISES, AND AIR OPERATED IMPACT AND ARBOR PRESSES

Use HAYNES STELLITE
TRADE-MARK
Tipped Tools
FOR THE HEAVY-DUTY JOBS

If you need a tool with a large cross-section . . . one that is bent or offset . . . or used with long over-hang, one of the 22 standard styles of HAYNES STELLITE tipped tools may solve your problem. If none of the standard styles or sizes meets your requirements, we can make up special tipped tools to your specifications.

HAYNES STELLITE tipped tools consist of a cutting tip of cast cobalt-chromium-tungsten alloy tool metal brazed to a tough steel shank. They can be used for turning, boring, and facing—and for many types of forming and grooving operations. Since the alloy is abrasion-resistant and retains its cutting hardness even at red heat, you can be sure of high cutting efficiency with long life between grinds.

Write to us for a copy of the fully illustrated catalog "HAYNES STELLITE Metal-Cutting Tools." It lists all the available types and styles of HAYNES STELLITE tools, prices, and other pertinent data.

Haynes Stellite Company
Unit of Union Carbide and Carbon Corporation
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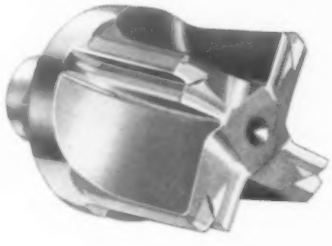
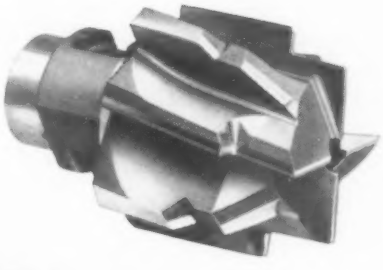
General Offices and Works, Kokomo, Indiana
Sales Offices
Chicago — Cleveland — Detroit — Houston
Los Angeles — New York — San Francisco — Tulsa

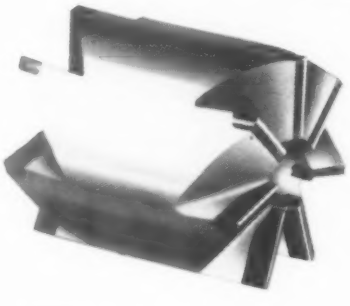
The trade-marks "Haynes" and "Haynes Stellite" distinguish products of Haynes Stellite Company

"ECLIPSE QUALITY"

WHAT IT MEANS IN TERMS OF EFFICIENCY AND PROFIT *for You!*







1. DESIGN SERVICE. Eclipse engineers will design your cutters directly from part print. Your engineers will have more time to devote to other tool problems.

2. MAXIMUM LIFE. Eclipse engineering with 35 years experience behind it, assures cutter designs to give maximum life with minimum down time.

3. MULTIPLE OPERATIONS. Eclipse originated and developed multi-diameter cutters and its engineers are best qualified to design cutters to perform maximum operations at a single pass.

4. ASSURED QUALITY. Produced in the modern Eclipse plant with latest type equipment where quality is paramount and inspection rigid.

CUTTERS: H.S.S. and Tungsten Carbide Tipped—Multi-diameter—Inserted Blade—Center Cutting—Inverted and Down Drive—Double End Facers—End-Form—two piece Core Drills.

HOLDERS: Stop Collar—Bushing Guided—Adjustable length—Floating—Specials of all kinds.

Also complete stock of Standard Holders, Cutters and Pilots.

ECLIPSE COUNTERBORE CO.

Founded over thirty five years ago

DETROIT 20, MICHIGAN

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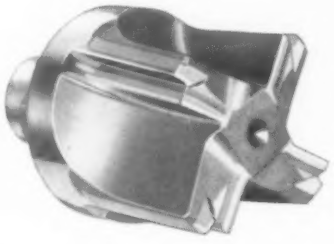
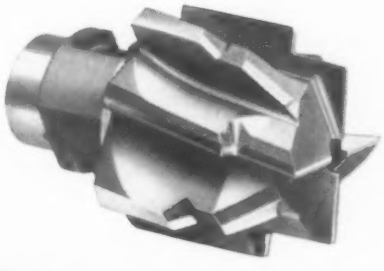
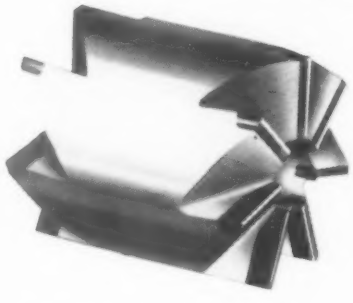
WHAT IT MEANS IN TERMS OF EFFICIENCY AND PROFIT *for You!*







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Also complete stock of Standard Holders, Cutters and Pilots.

ECLIPSE COUNTERBORE CO.

Founded over thirty five years ago

DETROIT 20, MICHIGAN

ON YOUR TURRET LATHES AND SCREW MACHINES

TOOL ENGINEERS

who want additional production capacity always specify

R and L TOOLS

Turning two diameters while drilling or reaming is just one of the many operations you can add when you use R and L Tools.

There are two good reasons why we are inserting this series of R and L TOOL advertisements in THE TOOL ENGINEER: Frankly, we want to sell more of our tool holders and, equally as important, we know that your shop will benefit from a dollars-and-cents standpoint when you start using R and L Tools.

For example, consider the R and L tool holder illustrated at right. Two additional operations are completed while a primary operation is being made. There is a complete line of such special R and L Tools to overcome almost every production problem faced by Turret Lathes and Screw Machines. We suggest that you start 1949 right by sending for your copy of the idea-packed booklet showing R and L Tools. It shows a great number of set-ups with R and L Tools which will amaze every cost- and production-conscious Tool Engineer.

Production Records
Always Tell
The Wisdom of Tooling
With R and L

R and L Tools

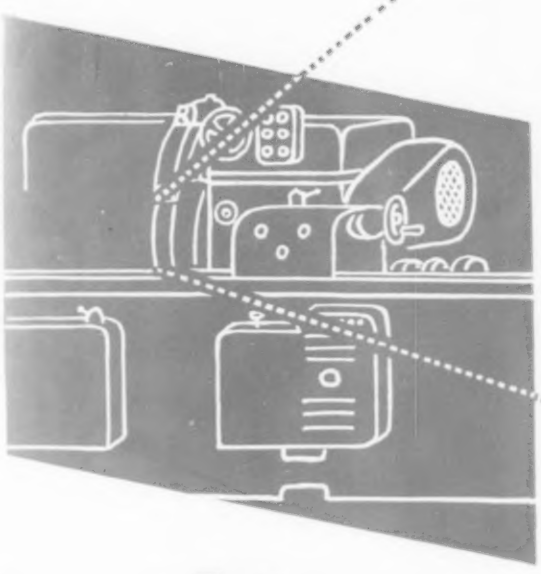
1825 Bristol Street **Nicetown, Philadelphia 40, Pa.**

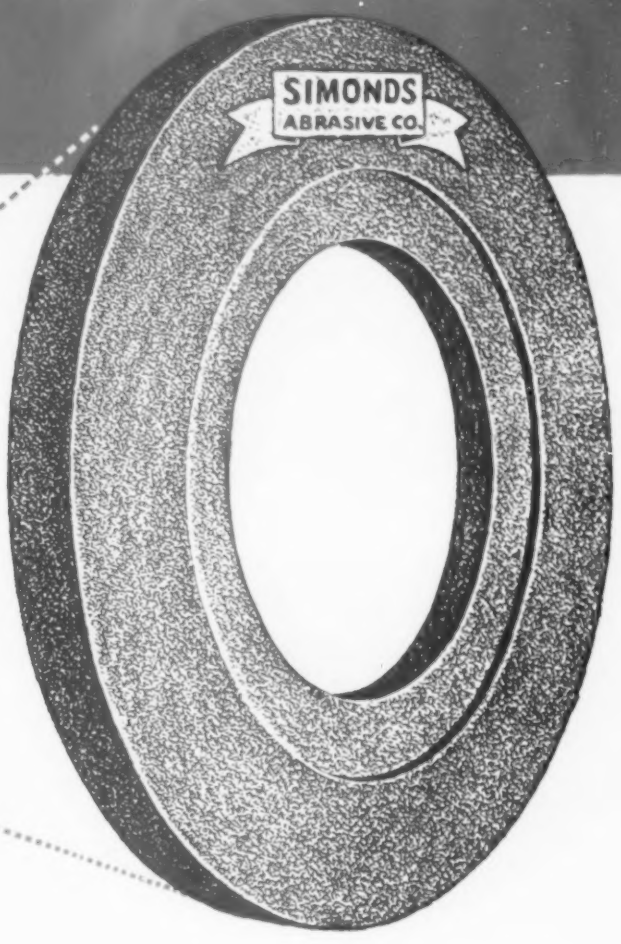
NEW! R and L Acorn Die Holder

Available in a wide variety of sizes, these R and L Acorn Die Holders are real production "helps." Large keyed ring washer separates cap and lock-nut and facilitates tightening and adjustments. Design of cap and lock-nut speeds up and greatly simplifies the accurate adjustment of die. Clutch mechanism is same as used in the popular R and L Tap and Die Holder.

SIMONDS
ABRASIVE CO.
PHILADELPHIA, PA.

Grinding Wheels





Try this on your cylindrical grinder

For high quality precision grinding . . . for fast, accurate work, minimum dressing and long wheel life.

These are features of Simonds Abrasive Company Cylindrical Grinding Wheels . . . furnished in grain and grade combinations to meet every cylindrical grinding requirement from heavy stock removal to micro-inch finishing . . . for steel, cast iron, non-ferrous metals and practically all non-metals . . . includes plain cylindrical, crankshaft, camshaft, centerless and roll grinding.

Availability: Simonds Abrasive Co. Distributors, located in all principal industrial centers of the U. S. and many foreign countries carry local stocks and are equipped to service your grinding wheel orders quickly and efficiently. Write for free Grinding Wheel Data Book which includes complete listing of grain and grade recommendations for cylindrical grinding jobs and name of distributor serving your area.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

the only plant in the world devoted entirely to the manufacture of

HIGH SPEED STEELS

RED CUT SUPERIOR—America's best known tungsten high speed steel—for all cutting purposes.

VASCO M-2—Tungsten-Molybdenum high speed steel for general cutting purposes.

VAN-LOM and 8-N-2—Molybdenum high speed steels, for general cutting purposes.

RED CUT COBALT—Extra Duty—heavy cuts, fast speeds, hard or abrasive materials.

GRAY CUT COBALT—Super Duty—hogging cuts, high speeds, heat treated or abrasive materials.

NEATRO—Superior Wear Resistance—delivers top performance on non-ferrous materials, cast steel, cast iron, heat treated steels.

VASCO SUPREME—Entirely New—higher hardness, higher wear resistance, higher hot hardness, higher speeds.

We do not compromise quality by combining in a single plant the manufacture of carbon and alloy tool steels with High Speed Steels. Our Vanadium Works* is devoted entirely to the manufacture of High Speed Steels, and is the only plant in the world so constituted . . . with melting furnaces, heating furnaces and furnace atmospheres, roll designs and even hammer blocks designed especially for the purpose—and used by men trained as specialists. NO WONDER these are *First Quality* High Speed Steels. Come and see for yourself—anytime.

*(Carbon and Alloy Tool Steels are made at our Colonial Works)

FIRST QUALITY TOOL STEELS

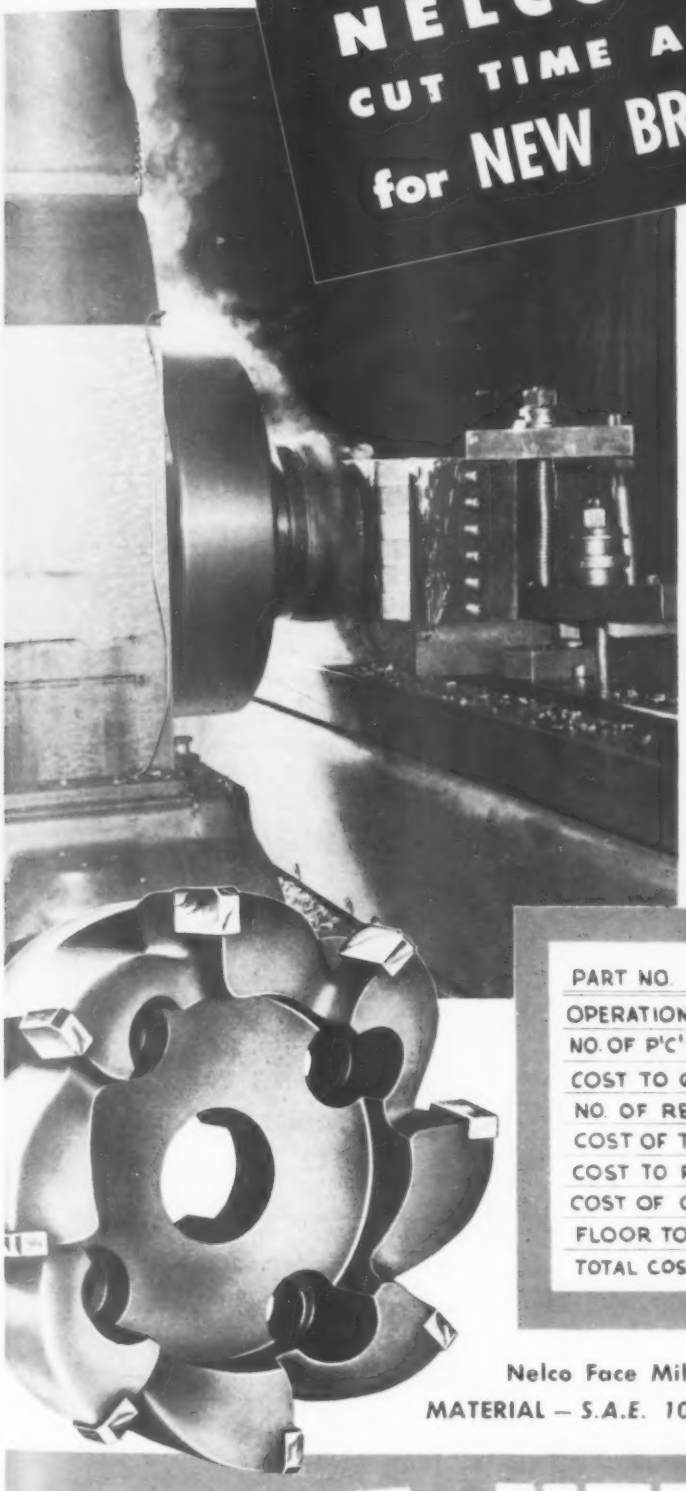
Vanadium-Alloys Steel Company

COLONIAL STEEL DIVISION
ANCHOR DRAWN STEEL CO.

Latrobe, Pa.

Here's how

NELCO FACE MILLS CUT TIME AND REDUCE COSTS for NEW BRITAIN MACHINE CO.



Milling the Forming Slide Cam blanks for New Britain-Gridley Model 60 six-spindle automatic Bar Machines is done six at a time with the No. 8106F Nelco Face Mill with carbide tipped blades.

The time and cost analysis chart shows the comparative savings effected by Nelco carbide tipped cutters over the tools formerly used. This is only one of many New Britain Parts which are milled efficiently with Nelco Tools.

PART NO. A 407 1782	NAME Forming Slide Cam blank	
OPERATION 110 mill end	CARBIDE	HIGH SPEED
NO. OF P'C'S. PER GRIND	400	100
COST TO GRIND	$7.50	$3.75
NO. OF REGRINDS	8	10
COST OF TIPS	$8.00	$16.20
COST TO RETIP & GRIND	$16.00	$6.00
COST OF CUTTER PER PIECE	$ .024	$.054
FLOOR TO FLOOR TIME	1½ min	3½ min
TOTAL COST TO MILL ONE P'C.	$ .144	$.324

Nelco Face Mill No. 8106F . . . **SPECIFICATIONS**

MATERIAL — S.A.E. 1045 GAS CUT SPEED — 500 R.P.M. FEED — 15" P.M.

WRITE for descriptive literature and name of your Nelco Distributor.

NELCO TOOLS

For that extra edge in production

NELCO TOOL CO., INC., Manchester, Conn.

Index of Tool Engineer Advertisers

MARCH, 1949

Preventing END BEARING OF GEAR TEETH...

- increases their factor of safety
- reduces gear noise
- and prolongs service life

Conventional gear teeth (spur or helical) can be expected to behave as they should theoretically only on the drafting board. When they are made of steel and assembled in a power unit, it is a rare accident when bearing is uniform across the entire faces of any two mating teeth. In nearly every case bearing is concentrated at one end of the tooth or the other where it is most vulnerable to failure.

The remedy is the Elliptoid Tooth Form, engineered and produced by Red Ring engineers 12 years ago. The Elliptoid Tooth Form positively prevents end bearing as demonstrated by actual experience in hundreds of applications.

One nationally known manufacturer of trucks and tractors received frequent complaints of gear tooth failures until he adopted the Elliptoid Tooth Form. Since then such complaints have practically vanished. Elliptoid transmission gears tested by this manufacturer for 125 hours under a load of 140 foot pounds and then for an additional 125 hours at 180 foot pounds showed no harmful effects.

Another top ranking tractor manufacturer says the service life of his Elliptoid gears is 30 times greater than that of previous conventional gears. Elliptoid gears are produced on Red Ring Gear Shaving Machines.

Send for descriptive literature.

SPUR AND HELICAL
GEAR SPECIALISTS
ORIGINATORS OF ROTARY SHAVING
AND ELLIPTOID TOOTH FORM

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • • • • • • • • • DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

THOUSANDS OF MANUFACTURERS KNOW FROM EXPERIENCE

nothing can cut costs like WALES

HOLE PUNCHING AND NOTCHING EQUIPMENT

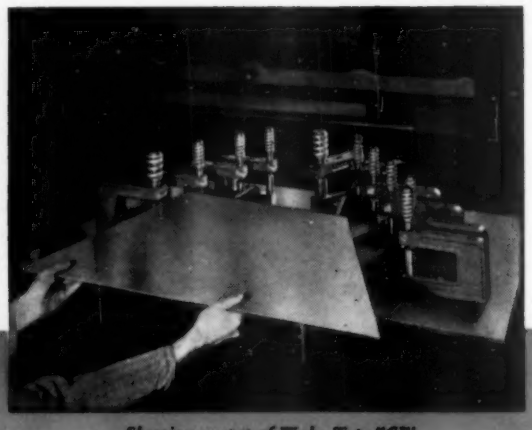
Here's an example... The case history of Wales Equipment with the Butler Manufacturing Company started by a Wales Service Engineer call. The result of this and subsequent calls, Butler has standardized on Wales Equipment for punching bolt holes in parts of their metal pre-fabricated buildings. In the advertisement at left, Butler stresses the point of LOWER COSTS. Wales Equipment with exclusive time-saving, money-saving features contributed to these LOWER COSTS.

IT'S TOO BIG A STORY TO TELL ON THIS PAGE. AS A SUGGESTION, however, before deciding on the hole punching and notching portion of your tooling program, check with Wales-Strippit engineers who may solve your particular hole punching and notching problems by using STANDARD adaptations of STANDARD Wales Equipment. Join the large group of leading manufacturers who have made it a rule to call on Wales-Strippit before putting holes and notches in angles, channels, extrusions and sheets by any method. *Write for Catalog CJ.*

WALES-STRIPPIT CORPORATION
GEORGE F. WALES, President
393 PAYNE AVENUE, NORTH TONAWANDA, N.Y.
(Between Buffalo and Niagara Falls)
WALES-STRIPPIT OF CANADA, LTD., HAMILTON, ONTARIO

Specialists in Punching and Notching Equipment

Showing a typical setup of Wales Type "CJ" Hole Punching Units in a press brake similar to those used by Butler Manufacturing Company.



Showing a setup of Wales Type "CJ" Hole Punching Units in a stamping press.